Utah
Department of
Agriculture and Food

State Ground-Water Program 2000

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ACKNOWLEDGMENTS

The Utah Department of Agriculture and Foods (UDAF) 2000 Ground-Water Sampling Program is successful because of the contributions made by many people. UDAF's ground-water steering committee consists of Commissioner Cary Peterson, Directors; Randy Parker, Dick Wilson, and Dr. David Clark, and Section and Program Leaders; George Hopkin and Clark Burgess. This committee gave guidance, support, and direction to the program, which resulted in its success.

Efforts of members of the Utah Association of Conservation Districts (UACD) have also contributed greatly to the success of the 2000-sampling program. They helped select sampling sites and navigated us to locations of wells to be sampled. Their knowledge of local areas and contact with people who desired well sampling proved invaluable.

Terry Monroe, Jarred Manning, and Will Atkin of Utah Division of Water Rights (DW) also helped in selection of well sites in the Pahvant and Curlew valleys. Mike Lowe and Janae Wallace of the Utah Geological Survey allowed us to participate in a joint ground water study in Castle Valley in Grand County, Utah, which led to extensive sampling in the Moab and La Sal areas.

This program has received excellent support from the UDAF department of chemistry laboratories, which performed sample analyses. The State Chemist, Dr. David Clark; staff chemists; Mohammed Sharaf and Cham Hoang, and technical assistant; Alba Fields provided prompt analysis of pesticide and inorganic samples collected during the year.

A critical part of the program is the collection, distribution and maintenance of data. Anne M. Johnson, UDAF's GIS Coordinator, has been most helpful by efficiently producing GIS-based maps and giving suggestions for proper data management. Her work is exhibited throughout this report.

Ivan Sanderson and Virginia Sligting have been the catalyst in the final preparation of this report. Their editing has made the report much more usable and readable. Their careful proofing has insured a much more accurate document.

Final thanks are extended to the well owners without whose participation and trust this program would not have functioned.

Prepared by:
Mark Quilter
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Front Cover: Ivan Sanderson and Janae Wallace bailing a well in Castle Valley, Utah

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The UDAF State Ground-Water Program is funded by the State Legislature to assist private well owners and other agencies, organizations and concerned citizens in developing a better understanding of water quality. Provisions of the Clean Water Act exclude irrigation, livestock, and other private wells although these wells account for the majority of ground-water use in the State of Utah.

This report covers activities of the Utah Department of Agriculture and Food's (UDAF) State Ground-Water Program for 2000.

Cooperative Effort

UDAF has a memorandum of understanding (MOU) with the Utah Division of Water Rights (DWR) for collecting ground-water data from the Pahvant and Curlew valleys. Sample analyses were done for inorganic and organic contaminants that influence water quality. Guidance from DWR has helped in selecting sampling areas and sharing data. Sampling was also done in cooperation with the Utah Geological Survey in the Castle Valley area of Grand County, Utah.

UDAF also works closely with Utah Department of Environmental Quality (DEQ) in providing expertise for the State Pesticide Management Plan and other ground-water programs. This relationship benefits UDAF by allowing agriculture's voice to be heard and ideas considered during the planning process. UDAF is an essential link between DEQ and Utah's farmers and ranchers regarding environmental issues.

UDAF's State Ground-Water Program uses local Soil Conservation District (SCD) members to locate sample sites. Their cooperation and knowledge of local areas has been very useful in distributing information, selecting wells for sampling, and meeting well owners.

Program Organizational and Sampling Procedures

UDAF meets with SCDs to provide pertinent information on ground-water issues. Districts then select wells in their area for sampling and obtain preliminary sample information by using UDAF's Pre-Sample Information Form (Fig. 1). In Pahvant and Curlew valleys, WR selected wells to be sampled.

SCD members then escorted UDAF personnel to selected well sites. At each well, the location was recorded using a Global Positioning System (GPS) receiver. Water was then collected for inorganic, bacteria, and pesticide analyses at each well. Samples were packed in ice and taken to the laboratory for analysis. A report summarizing laboratory results was sent to each well owner. GPS information was provided to UDAF's GIS administrator who provided maps of the sampled areas.

During 2000, UDAF tested all samples for Coliform and E. coli bacteria using IDEXX Colilert MUG kits in the field. This has been a significant addition to the program, first implemented in 1998. We also conducted nitrate testing in the field using Hach equipment and procedures.

Figure 1

PRE-SAMPLE INFORMATION FORM

(This is a non-regulatory program. Data from sampling this well will be for your use and information)

Name:_____ **Telephone #:**_____
Address:_____ **Water Right #:**_____
City:_____ **Depth of Well:**_____
Conservation District:_____ **Depth of Water:**_____

Please sketch a map showing how to locate your well (North is the top of the page.) Please give street name, and distances from major intersections or any other landmarks that may be significant. If you need more room sketch map on back of sheet.

Can we turn your pump on without you being present?_____
Are there instructions we need to sample your well?_____
_____

By signing this form you are giving permission for the State of Utah Department of Agriculture and Food to cross your property and sample your well.

I the undersigned am the lawful agent of the above described well and grant permission to the Utah Department of Agriculture and Food to sample said well. I also grant access permission to the well.

_____ _____
Sign on the above line **Date**

For any further information contact:

Mark Quilter, Ground Water Specialist
UDA, 350 North Redwood Road
Box 146500
Salt Lake City, UT 84114-6500
(801) 538-9905 Fax: (801) 538-9436

Areas Sampled

During 2000, 354 samples were taken from wells, drains, and springs in 6 of the 7 UACD zones in the state. Each of the areas sampled is addressed in this report. A table of chemical analyses and a map showing sample locations is presented for each area. This is summarized in a narrative report, provided for each sampled area.

Summary of Water Quality for 2000

This section presents a general summary of ground water quality for sampling done during 2000. There were no pesticide detections in the 354 samples taken during the sampling season for 2000. Samples show a broad diversity of water quality throughout the state, with electrical conductivity (EC) ranging from a low of 167 micro-mhos per centimeter (μmhos/cm) to a high of 41, 300 μmhos/cm, with a mean of 1, 342 μmhos/cm. EC is an indirect measure of concentration of dissolved salts in the water. Water with EC values exceeding 750 μmhos/cm may cause damage to sensitive plants when used for irrigation. When EC exceeds 3,000 μmhos/cm, severe damage to all but the most salt-tolerant plants is expected. One hundred and sixty-six samples exceeded an EC level of 750 μmhos/cm and 23 samples exceeded the 3,000 μmhos/cm level.

The Clean Water Act sets an aesthetic standard of 833 μmhos/cm for drinking water. Water that exceeds this concentration of dissolved salts may have objectionable flavor. One hundred and fifty-nine samples exceeded this value. When the EC value exceeds 3,333 μmhos/cm, it becomes a health issue. Twenty-one samples exceeded this value. For livestock, which have a higher tolerance for saline water, the critical value is 8,333 μmhos/cm. Only 15 sites exceeded this level.

Temperatures measured at the sample point at the time of sampling also indicate the diversity of ground water quality throughout the state. During 2000, water temperatures ranged from just above freezing, at 3.8 degrees Celsius (°C) to above body temperature, with a high reading of 37 °C. The average measured temperature was 16.5 °C.

An important chemical characteristic of water is the pH, which is a measure of acidity or alkalinity. This provides a general indication of the types of minerals and compounds that may be found in the water. Generally the ground water in Utah is slightly alkaline, with a mean pH of 7.58. The range of pH values for this year's samples is 5.89 to 9.65. Water at either end of this range has characteristics that adversely affect water quality. At the low end, water with pH of less than 6.5 can have heavy concentrations of dissolved minerals. At the high end, water with pH greater than 9.0 usually indicates that excessive dissolved sodium is present.

Hardness of water is determined by how much calcium and magnesium are in the water. In Utah, calcium and magnesium are plentiful in soils and therefore also in ground water. Hardness values based on grains per gram of water ranged from 0.19 (soft) to 66.52 (very hard) with an average of 8.03 (hard). Soft water can have high sodium values and may not be fit for culinary use even though it is classified as soft.

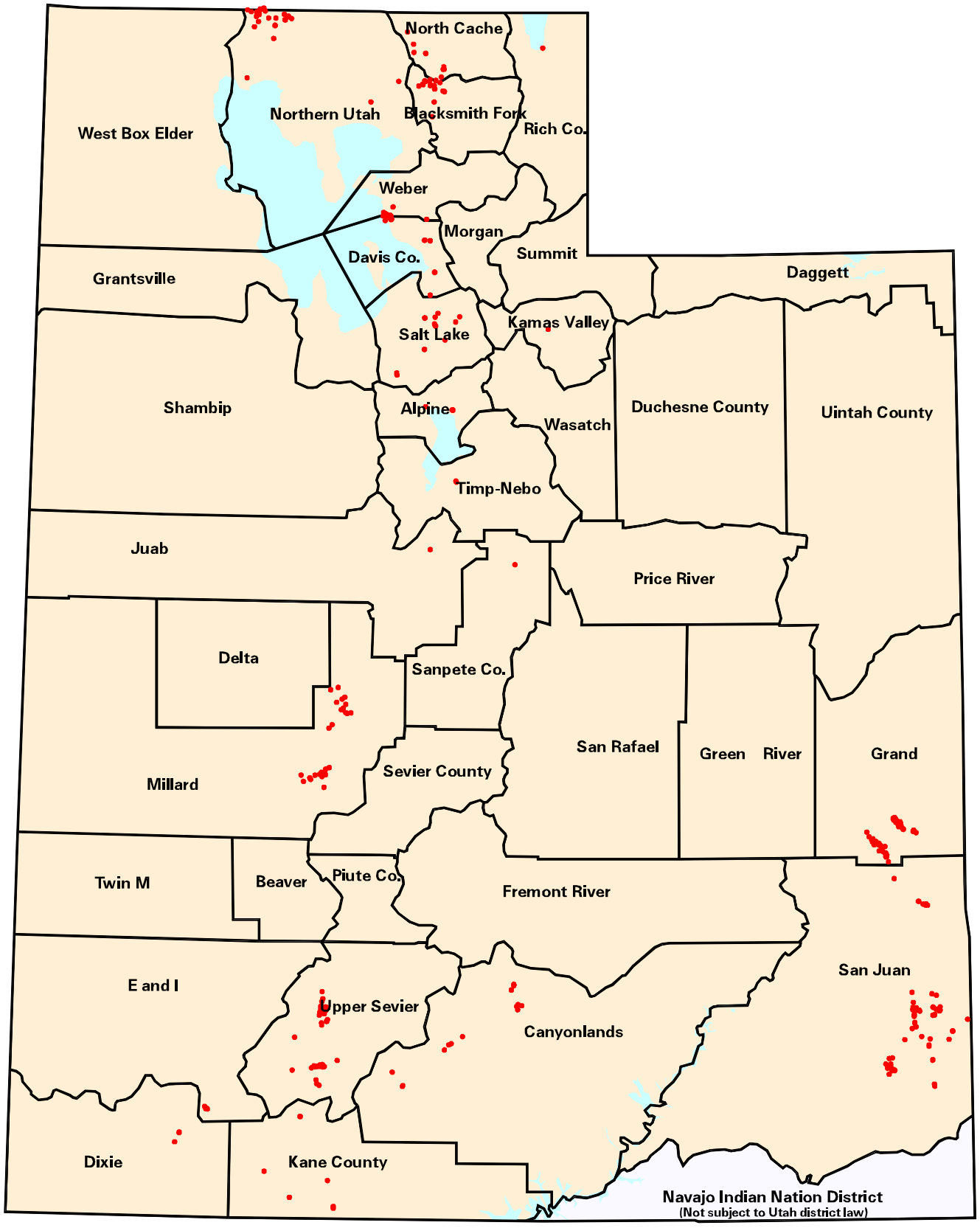
In addition to its influence on water quality, sodium also affects soil. Sodium causes soil particles to separate and frees organic matter. Soils with high sodium concentrations appear as dark, slippery, waterlogged areas. These soils are not suitable for crop production because air and water cannot pass through them. An indicator that measures whether irrigation water can damage soils because of excess sodium is called the Sodium Absorption Ratio (SAR). SAR values of 3 may indicate the beginning of soil degradation. SAR values of 9 or above result in

severe damage. SAR values for samples this year ranged from 0.08 to 54.2, with a mean value of 2.43. Special irrigation practices are required when using water with high SAR values.

As found during our sampling in previous years, presence of bacteria is a major problem with private water systems. Thirty-seven percent of the wells and springs sampled this year-tested positive for Coliform bacteria. This class of bacteria by itself is not usually a health problem, but it indicates that surface waters, soil, or other contaminants are entering the well. Problems are more commonly seen in older wells. Causes range from improper casing and caps, to wells that are too shallow, and systems that have been improperly maintained. Of greater concern is the presence of E. coli in water samples. During 2000, 7% of the wells and springs sampled tested positive for E. coli bacteria. This indicates contamination by mammalian fecal material, the only source for this bacterium. The source may be effluent from septic systems gaining access to the well casing or the aquifer, poor construction with livestock near the well head, or open wells in areas where animals or manure are present.

More detailed descriptions of water quality for each sampled area are presented elsewhere in this report. This report presents general results for each zone and district and in some cases areas within districts. Each area has an associated map, showing sample site locations and a table of chemical, bacterial, and physical characteristics of the water at the sampled site. Values that exceed drinking water, livestock, irrigation, or Clean Water Act standards are shown in shaded **bold type** on each table. Sample site locations can be identified on the map by using the Map ID number found on the associated table. Values of “-0.1” indicate that the designated element or compound was not measured above the detection limits for the analytical procedure. Appendix I lists critical values for each standard.

2000 Ground Water Sample Locations
By Soil Conservation District



Utah Department of Agriculture and Food GIS March, 2001

Zone 1

Utah Soil Conservation District, Zone 1 consists of four districts in the three counties comprising the northern tier of the state, including Box Elder, Cache, and Rich counties.

Fifty-five sites were sampled in the four districts in Zone 1 during the spring, summer and fall of 2000. These included 18 samples in the Blacksmith Fork District, 10 in the North Cache District, 22 in the Northern Utah District and one in the Rich District. Four wells located just across the state line in Idaho were also sampled. A separate narrative is presented in this report for each district, along with data tables and maps showing approximate locations of sample sites. The Idaho wells are discussed as part of the Northern Utah District. In each data table, water quality criteria are presented for irrigation, livestock, and culinary use. Since water use may overlap among these categories for a single well, analytical results are compared to all three sets of criteria. The single well that was sampled in the Rich District will be included in the report for 2001 after more sites in that district are sampled.

Blacksmith Fork District

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm, salt-sensitive plants begin to be affected. Only one sample was found to have an EC value greater than 750 μmhos/cm—sample 219, which has a value of 917. None of the samples exceed the severe-injury level of 3,000 μmhos/cm.

Sodium adsorption ratio (SAR) measures quantities of sodium (Na) in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants, and values greater than 9 cause severe problems. None of the water samples in this district have elevated SAR values.

Bicarbonate (HCO_3), an ion common to water solutions, can damage plants in excessive amounts—especially when used in sprinkler irrigation. Bicarbonate may cause white deposits on plants and their fruits, which degrade their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems appear when it exceeds 8.5. All of the samples collected in this area have high bicarbonates, which is common for water in Utah. Sample 219 exceeds 8.5, the level above which severe problems appear.

Samples 195, 196, 197, and 198 have elevated manganese (Mn) concentrations. Manganese above 0.2 ppm can injure plants and cause reduction in dry matter production. Excess manganese interferes with the plant's ability to use other nutrients such as calcium.

Samples 193, 195 through 200, 219, 220 and 304 have elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

No other elements were detected in concentrations harmful to plants.

Livestock:

All of the samples meet livestock quality standards.

Culinary:

The water sampled in this area ranges from moderately hard to hard, with GPG (grains per gallon) ranging from 4.8 to 7.7 with a mean of 5.8. Water temperatures at the time of sampling ranged from 11.2 °C to 19 °C, with a mean of 13.9 °C. pH for the area ranges from 6.65 to 9.65, with a mean of 7.14.

Salinity (EC) for sample 219 exceeds the EPA aesthetic standard of 833 µmhos/cm. At the detected level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333.

Several minerals were found to exceed the aesthetic drinking water quality standard. Samples 194 and 196 have high iron (Fe). This can cause discoloration of plumbing fixtures and promote the growth of iron bacteria, which stain anything that it contacts. Again, this is an aesthetic issue, not a health concern.

Nine samples have high manganese (Mn) concentrations—188, 191, 193 through 198 and 219. EPA has set an aesthetic standard of 0.05 ppm for manganese. Water with higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develops only in the digestive systems of mammals. Although presence the of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminants are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 195, 197, 199, 200, 201, 219, 220, and 304 are contaminated with Coliform bacteria. Samples 200 and 304 are contaminated with E. coli. These wells should be inspected carefully to determine the source of contamination

Sample Site Test Data for Blacksmith Fork District

Data from listed sample numbers continued on next page

Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co
188	-0.1	-0.1	-0.1	0.176	-0.1	76.729	-0.1	7.68	-0.1
189	-0.1	-0.1	-0.1	0.059	-0.1	64.638	-0.1	10.929	-0.1
191	-0.1	-0.1	-0.1	0.106	-0.1	71.435	-0.1	7.291	-0.1
192	-0.1	-0.1	-0.1	0.095	-0.1	71.132	-0.1	7.393	-0.1
193	-0.1	-0.1	-0.1	0.138	-0.1	59.523	-0.1	31.36	-0.1
194	-0.1	-0.1	0.071	0.133	-0.1	58.244	-0.1	22.546	-0.1
195	-0.1	-0.1	-0.1	0.132	-0.1	55.468	-0.1	22.71	-0.1
196	-0.1	-0.1	0.078	0.137	-0.1	56.301	-0.1	27.333	-0.1
197	-0.1	-0.1	0.084	0.223	-0.1	76.788	-0.1	34.97	-0.1
198	-0.1	-0.1	0.089	0.097	-0.1	62.391	-0.1	33.959	-0.1
199	0.049	-0.1	-0.1	0.07	-0.1	93.55	-0.1	16.39	-0.1
200	-0.1	-0.1	-0.1	0.065	-0.1	75.473	-0.1	10.425	-0.1
201	-0.1	-0.1	-0.1	0.073	-0.1	77.333	-0.1	13.392	-0.1
219	-0.1	-0.1	0.117	0.086	-0.1	67.297	-0.1	28.449	-0.1
220	-0.1	-0.1	-0.1	0.174	-0.1	97.632	-0.1	42.751	-0.1
221	-0.1	-0.1	-0.1	0.052	-0.1	72.597	-0.1	10.795	-0.1
222	-0.1	-0.1	-0.1	0.053	-0.1	71.714	-0.1	7.473	-0.1
304	-0.1	-0.1	-0.1	0.078	-0.1	83.446	-0.1	-0.1	-0.1

Sample	Mo	Na	Ni	NO3-N	P	Pb	S	Se	V
188	-0.1	9.212	-0.1	0	-0.1	-0.1	7.405	-0.1	-0.1
189	-0.1	10.553	-0.1	0	-0.1	-0.1	15.298	-0.1	-0.1
191	-0.1	7.972	-0.1	1.3	-0.1	-0.1	19.25	-0.1	-0.1
192	-0.1	8.094	-0.1	1.3	-0.1	-0.1	19.601	-0.1	-0.1
193	**0.013**	36.343	-0.1	0.9	-0.1	-0.1	0.239	-0.1	-0.1
194	-0.1	30.235	-0.1	1	-0.1	-0.1	1.496	-0.1	-0.1
195	**0.047**	39.817	-0.1	0.8	-0.1	-0.1	0.211	-0.1	-0.1
196	**0.035**	48.269	-0.1	1	0.267	-0.1	0.275	-0.1	-0.1
197	**0.047**	41.165	-0.1	0.9	0.189	-0.1	0.312	-0.1	-0.1
198	**0.035**	66.012	-0.1	1	0.251	-0.1	0.301	-0.1	-0.1
199	**0.01**	18.982	-0.1	2.5	-0.1	-0.1	3.059	-0.1	-0.1
200	**0.013**	9.966	-0.1	1.2	-0.1	-0.1	8.071	-0.1	-0.1
201	-0.1	11.782	-0.1	1.5	-0.1	-0.1	8.462	-0.1	-0.1
219	**0.077**	32.435	-0.1	1.1	-0.1	-0.1	4.104	-0.1	0.014
220	**0.021**	49.119	-0.1	1	-0.1	-0.1	16.294	-0.1	-0.1
221	-0.1	9.231	-0.1	1.2	-0.1	-0.1	18.057	-0.1	-0.1
222	-0.1	7.727	-0.1	1.5	-0.1	-0.1	18.798	-0.1	-0.1
304	**0.021**	13.025	-0.1	0.9	0.206	-0.1	10.658	-0.1	-0.1

Bolded and shaded values exceed minimum irrigation and livestock standards

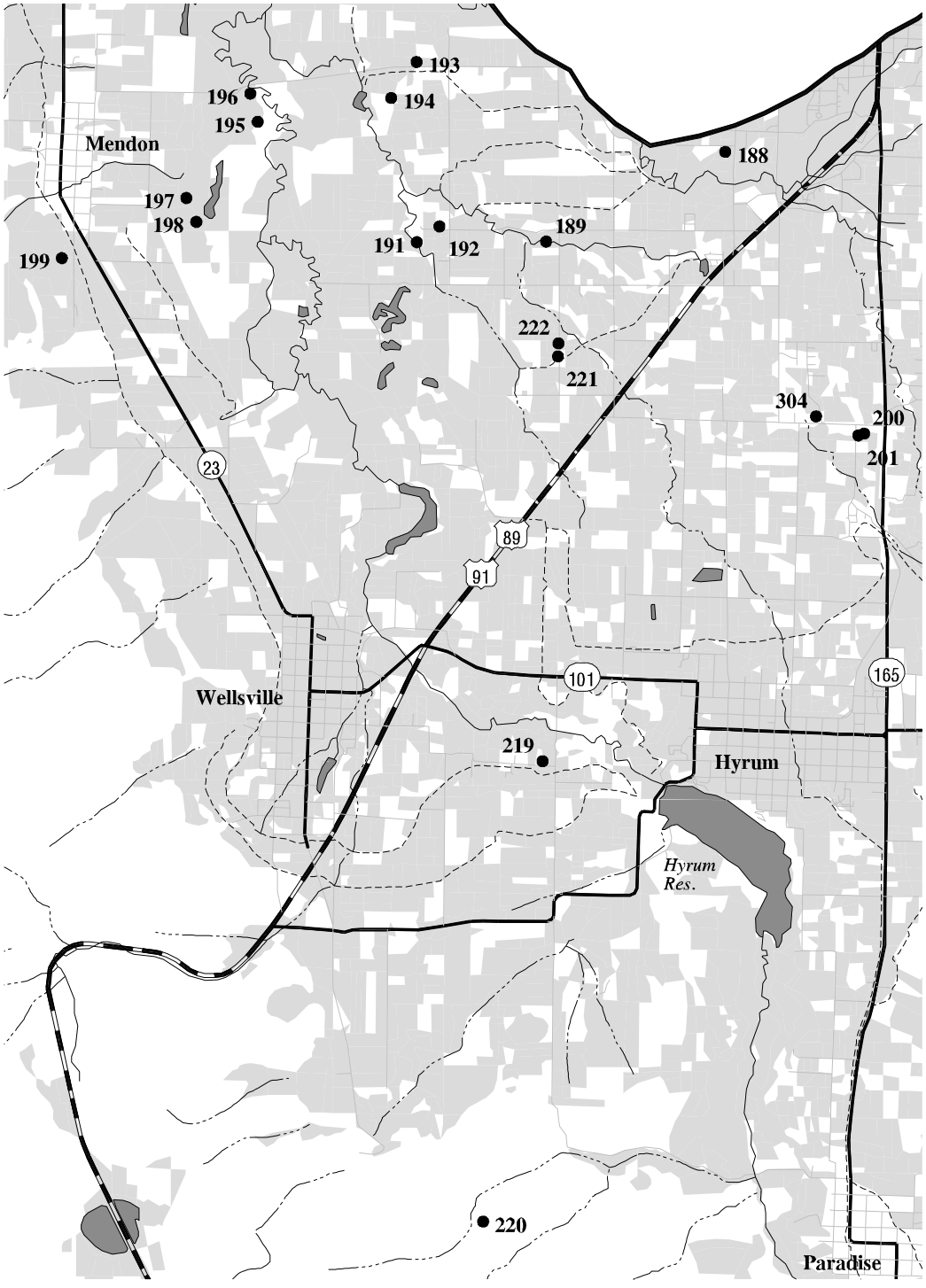
Sample Site Test Data for Blacksmith Fork District

Sample	CO3	Cr	Cu	Fe	HCO3	K	Li	Mg	Mn
188	-0.1	-0.1	0.025	0.255	**5.801**	3.6	-0.1	31.265	**0.132**
189	-0.1	-0.1	-0.1	0.026	**4.229**	1.505	-0.1	28.819	-0.1
191	-0.1	-0.1	-0.1	0.095	**4.268**	2.342	-0.1	29.676	**0.24**
192	-0.1	-0.1	0.022	0.104	**4.132**	2.066	-0.1	29.742	-0.1
193	-0.1	-0.1	0.029	0.141	**6.363**	2.064	-0.1	21.992	**0.088**
194	-0.1	-0.1	0.043	**0.318**	**4.986**	3.116	-0.1	23.898	**0.153**
195	-0.1	-0.1	-0.1	0.115	**5.762**	6.766	-0.1	27.363	**0.277**
196	-0.1	-0.1	0.032	**0.304**	**5.044**	8.196	-0.1	26.387	**0.327**
197	-0.1	-0.1	-0.1	0.214	**5.995**	7.375	-0.1	22.486	**0.296**
198	-0.1	-0.1	-0.1	0.151	**6.421**	11.124	-0.1	19.414	**0.406**
199	-0.1	-0.1	0.033	0.082	**6.615**	1.362	-0.1	10.655	-0.1
200	-0.1	-0.1	0.028	-0.1	**5.316**	3.771	-0.1	28.113	-0.1
201	-0.1	-0.1	0.021	0.027	**5.122**	2.261	-0.1	27.636	-0.1
219	-0.1	-0.1	-0.1	0.032	**9.196**	16.203	-0.1	65.066	**0.145**
220	-0.1	-0.1	-0.1	-0.1	**5.781**	0.559	-0.1	13.562	-0.1
221	-0.1	-0.1	-0.1	0.033	**4.578**	1.26	-0.1	29.351	-0.1
222	-0.1	-0.1	-0.1	0.027	**4.249**	1.237	-0.1	29.331	-0.1
304	-0.1	-0.1	-0.1	0.039	**6.072**	5.151	-0.1	30.996	-0.1

Sample	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
188	-0.1	0.2	6.3	0	0	12.2	609	7.00
189	-0.1	0.3	5.5	0	0	13.4	523	7.00
191	-0.1	0.2	5.9	0	0	13.3	552	7.00
192	-0.1	0.2	5.9	0	0	14.5	520	7.00
193	-0.1	1	4.8	0	0	12.7	566	7.00
194	-0.1	0.8	4.8	0	0	12.2	546	7.00
195	-0.1	1.1	4.8	**1**	0	15.3	609	7.00
196	-0.1	1.3	4.8	0	0	11.2	635	7.00
197	-0.1	1.1	5.8	**1**	0	11.7	715	7.00
198	-0.1	1.9	4.8	0	0	12.2	726	7.00
199	-0.1	0.5	6.1	**1**	0	13.3	584	6.65
200	0.047	0.2	6.1	**1**	**1**	16.4	583	7.00
201	0.698	0.3	6.1	**1**	0	17.8	596	6.83
219	-0.1	0.7	7.7	**1**	0	13.7	**917**	7.00
220	-0.1	1.2	6.5	**1**	0	19	737	7.00
221	0.047	0.2	6	0	0	12	580	7.26
222	-0.1	0.2	5.9	0	0	14	548	7.16
304	-0.1	0.3	6.7	**1**	**1**	15.4	662	9.65

Bolded and shaded values exceedminimum irrigation and livestock standards

Map #2 Blacksmith Fork SCD



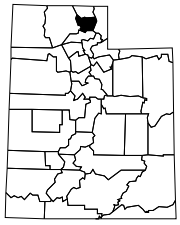
Map Scale 1:98,252
(1 inch = 1.55 miles)

Legend

- *2000 Sample Location*
- *Irrigated Cropland*
- *Water Body*
- *SCD Boundary*
- *Primary Route*
- *Primary Road*
- *Other Road*
- *Perennial Stream*
- *Intermittent Stream*
- *Canal or Ditch*

N

SCD Location



Utah Department of Agriculture and Food GIS January, 2001

North Cache District

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water that is high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected. Three samples have EC values greater than 750 μmhos/cm. They are samples 180, 182, and 183 with values of 2960, 1283, and 1642 respectively. None of the samples exceeded the severe-injury level of 3,000 μmhos/cm, which affects most plants.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. Two of the wells sampled in this district have elevated SAR values—samples 180 and 183, with values of 6.6 and 4.4, respectively.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates, which is common for water in Utah. Samples 180 and 183 exceed the 8.5 level with values of 32.32 and 9.51.

Some specific elements can be toxic to plants. Sample 180 has elevated boron (B), which is toxic to sensitive plants, when it exceeds concentrations of 0.7 ppm. It causes severe injury at 10.0 ppm. However, boron in trace amounts is required for proper plant growth. It is important to monitor this element because the margin separating safe health from toxicity is so small.

Chlorine, found in the form of chloride (Cl^-), can damage sensitive plants at concentrations above 145 ppm and concentrations exceeding 355 ppm can cause severe damage to almost all plants. Samples 182 and 183 have elevated chlorine at 276.9 and 239.8 ppm, respectively. Using this water in sprinkler irrigation, especially under windy conditions, increases the problem.

Samples 182, 183, and 305 have elevated concentrations of manganese (Mn). Manganese above 0.2 ppm can injure plants and cause reduction in dry matter production. Excess manganese interferes with the plant's ability to use other nutrients such as calcium.

Samples 180 through 186, and 305 have elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

No other elements were found in concentrations that are harmful to plants.

Livestock:

All of the sample sites meet livestock quality standards.

Culinary:

The water in this area ranges from moderately hard to very hard, with GPG (grains per gallon) ranging from 4.1 to 11.4 with a mean of 5.9. Water temperatures ranged from 12.2 °C to 23.3 °C and a mean of 17.17 °C. The pH for the area has a mean of 7.38 and ranges from 7.0 to 8.07.

Salinity for sample sites 180, 182, and 183 exceeds the EPA aesthetic standard of 833 μmhos/cm. At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333.

Only one mineral was found to exceed the aesthetic drinking water quality standard. Five samples have high manganese (Mn) concentrations—180, 182, 183, 190, and 305. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and the water has an off flavor.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develops only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminants are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 180, 181, 183, 184, and 305 are contaminated with Coliform. No samples were found to be contaminated with E. coli. These wells should be inspected carefully to determine the source of contamination.

Sample Site Test Data for North Cache District

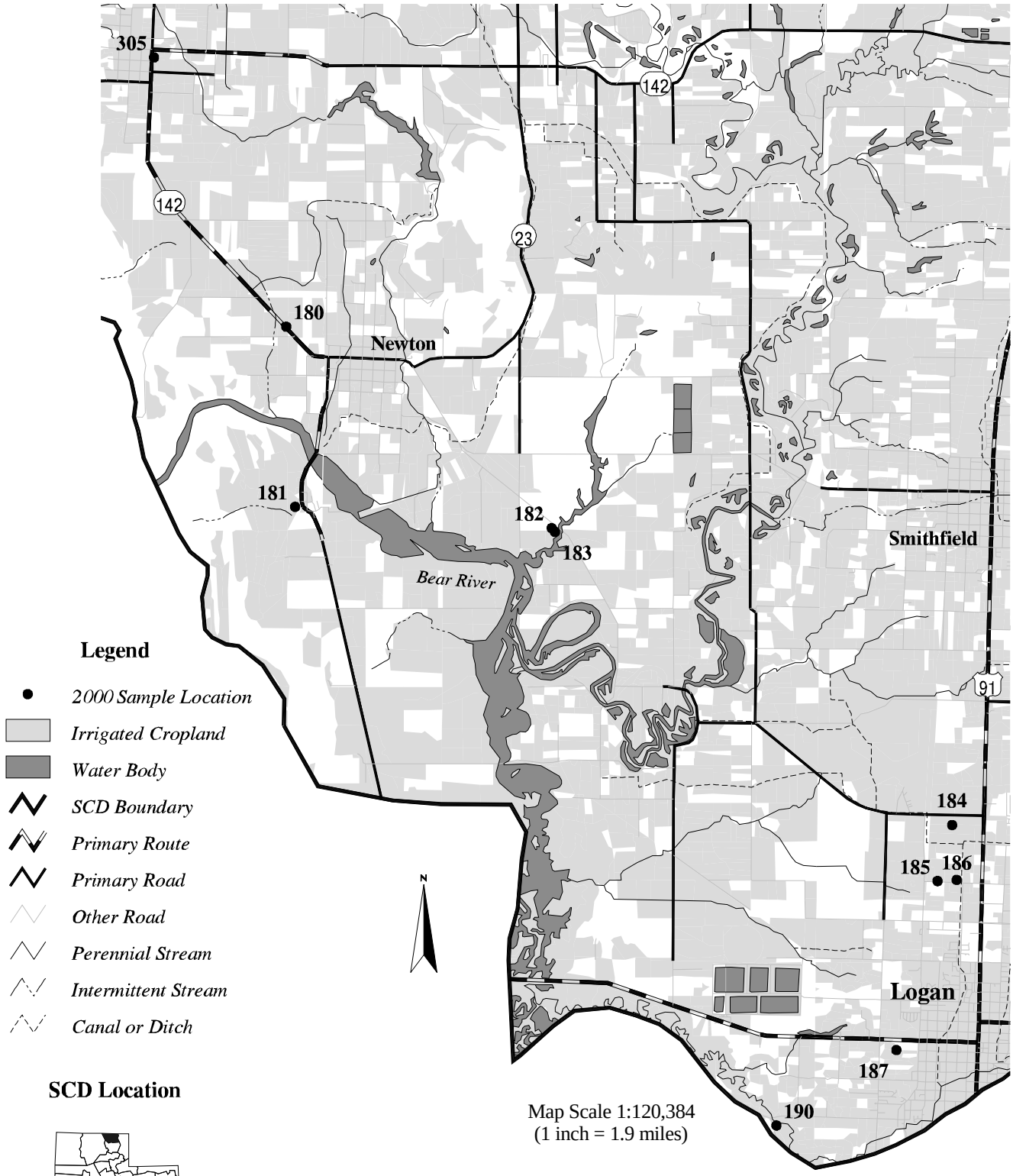
Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
180	-0.1	-0.1	**1.442**	0.849	-0.1	105.614	-0.1	95.386	-0.1	-0.1	-0.1	0.032
181	0.075	-0.1	0.088	0.023	-0.1	54.574	-0.1	35.346	-0.1	-0.1	-0.1	0.049
182	-0.1	-0.1	0.107	0.313	-0.1	91.625	-0.1	**276.94**	-0.1	-0.1	-0.1	-0.1
183	-0.1	-0.1	0.267	0.282	-0.1	58.372	-0.1	**239.773**	-0.1	-0.1	-0.1	0.032
184	0.16	-0.1	-0.1	0.166	-0.1	65.079	-0.1	7.089	-0.1	-0.1	-0.1	0.092
185	-0.1	-0.1	-0.1	0.157	-0.1	61.812	-0.1	16.799	-0.1	-0.1	-0.1	0.042
186	-0.1	-0.1	-0.1	0.159	-0.1	61.967	-0.1	16.328	-0.1	-0.1	-0.1	0.024
187	-0.1	-0.1	-0.1	0.39	-0.1	59.9	-0.1	6.187	-0.1	-0.1	-0.1	0.021
190	-0.1	-0.1	-0.1	0.088	-0.1	62.685	-0.1	9.376	-0.1	-0.1	-0.1	-0.1
305	-0.1	-0.1	0.109	0.068	-0.1	52.357	-0.1	23.311	-0.1	-1	-0.1	-0.1

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
180	0.202	**32.32**	65.097	-0.1	88.782	**0.131**	**3.098**	378.138	-0.1	2.1	-0.1	-0.1
181	0.035	**3.919**	6.393	-0.1	16.355	-0.1	**0.048**	46.226	-0.1	4.8	-0.1	-0.1
182	0.28	**4.229**	6.299	-0.1	31.7	**0.252**	**0.104**	106.777	-0.1	0.7	-0.1	-0.1
183	0.151	**9.506**	15.288	-0.1	50.449	**0.334**	**0.245**	188.261	-0.1	2.1	0.159	-0.1
184	0.053	**5.374**	6.531	-0.1	30.257	-0.1	**0.035**	15.311	-0.1	1.8	-0.1	-0.1
185	0.113	**4.675**	5.898	-0.1	25.709	-0.1	**0.031**	25.531	-0.1	3.3	-0.1	-0.1
186	-0.1	**4.695**	5.462	-0.1	26.351	-0.1	**0.029**	23.799	-0.1	2.5	-0.1	-0.1
187	0.031	**4.346**	1.476	-0.1	22.626	0.035	-0.1	5.243	-0.1	0.5	-0.1	-0.1
190	0.071	**4.578**	1.361	-0.1	25.498	**0.132**	-0.1	11.911	-0.1	0.8	-0.1	-0.1
305	0.179	**6.286**	13.496	-0.1	31.671	**0.467**	**0.08**	34.665	-0.1	1.3	-0.1	-0.1

Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
180	0.398	-0.1	-0.1	0.075	**6.6**	11.4	**1**	0	15.6	**2960**	7.06
181	13.06	-0.1	-0.1	0.052	1.4	4.1	**1**	0	14.5	630	8.07
182	0.378	-0.1	-0.1	-0.1	2.5	7.2	0	0	23.3	**1283**	7.73
183	0.501	-0.1	-0.1	-0.1	**4.4**	6.4	**1**	0	16.6	**1642**	7.35
184	3.275	-0.1	-0.1	0.925	0.4	5.6	**1**	0	19.2	564	7.61
185	7.223	-0.1	-0.1	-0.1	0.7	5.1	0	0	21.9	574	7.68
186	6.771	-0.1	-0.1	0.077	0.6	5.2	0	0	20.9	567	7.00
187	3.284	-0.1	-0.1	-0.1	0.1	4.8	0	0	14	426	7.00
190	7.474	-0.1	-0.1	-0.1	0.3	5.2	0	0	12.2	506	7.00
305	1.124	-0.1	-0.1	-0.1	0.9	4.9	**1**	0	13.5	685	7.29

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #3 North Cache SCD



Northern Utah District & Idaho

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (mhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 mhos/cm, salt-sensitive plants begin to be affected. Only two samples were found to have an EC value less than 750 mhos/cm—samples 171 and 218. Nine samples exceed the severe-injury level of 3,000 mhos/cm (155, 165 trough 169, and 174 through 176).

Sodium adsorption ratio (SAR) measures quantities of sodium (Na) in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants, and values greater than 9 cause severe problems. All but four water samples (161, 171, 172, and 218) in this district have elevated SAR values. Samples 155, 156, 166 through 169, 175, and 176 exceed the severe level of 9.

Bicarbonate (HCO3), an ion common to water solutions, can damage plants in excessive amounts—especially when used in sprinkler irrigation. Bicarbonate may cause white deposits on plants and their fruits, which degrade their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems appear when it exceeds 8.5. All of the samples collected this year have high bicarbonates, which is common for water in Utah except for sample 168. Sample 159 exceeds 8.5, the level above which severe problems appear.

Some specific elements can be toxic to plants. Sample 156 has elevated boron (B), which is toxic to sensitive plants, when it exceeds concentrations of 0.7 ppm. It causes severe injury at 10.0 ppm. However, boron in trace amounts is required for proper plant growth. It is important to monitor this element because the margin separating safe health from toxicity is so close.

Chlorine, found in the form of chloride (Cl^-), can damage sensitive plants at concentrations above 145 ppm and concentrations exceeding 355 ppm can cause severe damage to almost all plants. Samples 154, 157 through 164, 170, 172, 177, and 217 have elevated chlorine. Using this water in sprinkler irrigation, especially under windy conditions, increases the problem. Many of these samples also exceed the severe level (samples157 through 162, 164, 170, 177, and 217)

Copper (Cu) is toxic to plants when its concentration is greater than 0.2 ppm. Sample 156 has 2.759 ppm of copper well above the standard. Copper interferes with iron uptake and causes chlorosis in plants.

Samples 154 through 161 and 217 have greater than 0.01 ppm molybdenum. Though molybdenum is not toxic to plants in concentrations generally found in soil and water, livestock eating plants irrigated with water may be harmed when concentrations exceed 0.01 ppm.

No other elements were detected in concentrations harmful to plants.

Livestock:

Electrical Conductivity (EC) is the measure of salts in water. When the value exceeds 8,332 mhos / cm. Usually livestock will not drink water of this quality unless forced. Sample 175 exceeds the salinity standard for livestock with a value of 9520 mhos / cm.

Samples 156 and 165 have sulfur (S) levels of 167.65 and 219.504 ppm, which exceed the livestock standard for, sulfur. Sulfate can cause water to be off flavored and also diarrhea in animals not used to drinking it. Problems start when the sulfur level in water exceeds 167 ppm.

Sample 156 has arsenic (As) at 0.37 ppm, which exceeds the livestock standard of 0.2 ppm. This sample also have elevated lead (Pb) at 0.111 ppm, which exceeds the livestock standard of 0.1 ppm.

Culinary:

The water sampled in Northern Utah Conservation District, Zone 1 ranges soft to very hard, with GPG (grains per gallon) ranging from 3.4 to 36.2 with a mean of 12.60. Water temperatures at the time of sampling ranged from 13.3 C to 37.0 C, with a mean of 19.9 C. pH for the area ranges from 7.0 to 7.61, with a mean of 7.11.

Salinity (EC) for all samples except 171 and 218 exceed the EPA aesthetic standard of 833 mhos/cm. At the detected level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333. Samples 155, 165, 174, and 175 all exceed the health standard for salinity.

Several minerals were found to exceed the aesthetic and health drinking water quality standards. Arsenic (As) was found to exceed the primary health standard of 0.05 ppm in samples 155, 156, 159, and 165. Sample 156 exceeds the primary health standard for copper (Cu) of 1.0 ppm with a value 2.759 and also of lead (Pb) with a value of 0.111, twice the standard of 0.05 ppm.

Several minerals were found to exceed the aesthetic drinking water quality standard. Samples 154 through 157, 168 and 169 have high iron (Fe). This can cause discoloration of plumbing fixtures and promote the growth of iron bacteria, which stain anything that it contacts. Again, this is an aesthetic issue, not a health concern. Samples 156 and 168 have high manganese (Mn) concentrations. EPA has set an aesthetic standard of 0.05 ppm for manganese. Water with higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

Samples 156, 160, 164, 166, 169, 173, and 175 also have high sulfur (S). Sulfate is an anion that can cause flavor problems in drinking water if there is more than 83 ppm of soluble sulfur. Bacteria in the water uses sulfur and produces hydrogen sulfide gas (rotten egg gas). The bacteria that produce this compound can live in plumbing fixtures and even hot water heaters. It

is not uncommon to get strong odors when the hot water is turned on in areas where there is high sulfate. Generally, people cannot tolerate the odor from this gas. Even if the gas is not present, high sulfate concentrations can cause diarrhea in people not used to drinking it.

Samples 176 and 217 both exceed the EPA nitrate(NO_3-N) standard of 10 ppm NO_3-N. Nitrate is an important nutrient for plant growth. It is found in nitrogen fertilizers, manure, septic systems, and some minerals. Nitrate is toxic to young infants (usually less than 6 months of age) and causes “Blue Baby Syndrome”. EPA has established a standard of 10 ppm NO_3-N. Nitrate can only be removed from water by reverse osmosis or distillation.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develops only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminants are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

All <u>but</u> samples 156, 160, 164, 166, 169, 173, 175, 177, and 217 are contaminated with Coliform bacteria. Samples 154, 155, 168, and 217 are contaminated with E. coli. These wells should be inspected carefully to determine the source of contamination.

Sample Site Test Data for Northern Utah District and Idaho

Data from listed sample numbers continued on next page

Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
154	1.151	-0.1	0.177	0.1	-0.1	66.099	-0.1	**204.742**	-0.1	-0.1	-0.1	0.069
155	0.106	**0.068**	0.275	0.139	-0.1	123.502	-0.1	-0.1	-0.1	-0.1	-0.1	0.092
156	0.84	**0.37**	**1.718**	0.362	-0.1	391.244	-0.1	-0.1	0.028	-0.1	-0.1	**2.759**
157	0.104	0.039	0.179	0.087	-0.1	116.942	-0.1	**548.443**	-0.1	-0.1	-0.1	0.071
158	-0.1	-0.1	0.172	0.111	-0.1	119.734	-0.1	**445.088**	-0.1	-0.1	-0.1	0.054
159	0.092	**0.058**	0.218	0.085	-0.1	193.547	-0.1	**661.794**	-0.1	-0.1	-0.1	0.069
160	0.065	0.035	0.151	0.151	-0.1	92.184	-0.1	**365.929**	-0.1	-0.1	-0.1	0.073
161	0.067	-0.1	0.242	0.109	-0.1	94.604	-0.1	**182.222**	-0.1	-0.1	-0.1	0.078
162	-0.1	-0.1	0.135	0.038	-0.1	224.749	-0.1	**634.843**	-0.1	-0.1	-0.1	-0.1
163	-0.1	-0.1	0.145	0.184	-0.1	63.202	-0.1	**256.644**	-0.1	-0.1	-0.1	-0.1
164	-0.1	-0.1	0.106	0.157	-0.1	163.537	-0.1	**548.961**	-0.1	-0.1	-0.1	-0.1
165	-0.1	**0.078**	0.225	0.044	-0.1	198.581	-0.1	-0.1	-0.1	-0.1	-0.1	0.093
166	-0.1	-0.1	0.104	0.095	-0.1	79.089	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
167	-0.1	-0.1	0.101	0.103	-0.1	82.317	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
168	0.058	-0.1	0.155	0.05	-0.1	43.725	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
169	-0.1	-0.1	0.17	0.328	-0.1	96.688	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
170	-0.1	-0.1	0.092	0.136	-0.1	114.96	-0.1	**499.235**	-0.1	-0.1	-0.1	-0.1
171	-0.1	-0.1	-0.1	0.121	-0.1	72.001	-0.1	61.556	-0.1	-0.1	-0.1	-0.1
172	-0.1	-0.1	-0.1	0.255	-0.1	121.24	-0.1	**232.724**	-0.1	-0.1	-0.1	-0.1
173	-0.1	-0.1	0.123	0.12	-0.1	178.444	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
174	-0.1	-0.1	0.107	0.082	-0.1	289.84	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
175	0.041	-0.1	0.174	0.292	-0.1	483.346	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
176	-0.1	-0.1	0.144	0.299	-0.1	297.676	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
177	-0.1	-0.1	0.09	0.098	-0.1	154.528	-0.1	**557.443**	-0.1	-0.1	-0.1	-0.1
217	-0.1	-0.1	0.525	0.06	-0.1	57.9	-0.1	**460.198**	-0.1	-0.1	-0.1	-0.1
218	-0.1	-0.1	-0.1	0.07	-0.1	40.248	-0.1	9.175	-0.1	-0.1	-0.1	0.03

Bolded and shaded values exceed minimum irrigation or livestock standards

Sample Site Test Data for Northern Utah District and Idaho

Data from listed sample numbers continued on next page

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
154	**0.819**	**6.169**	14.408	-0.1	36.856	0.032	**0.083**	130.406	-0.1	3.5	0.143	-0.1
155	**0.302**	**3.434**	48.095	-0.1	64.379	-0.1	**0.234**	534.55	-0.1	1.4	0.235	-0.1
156	**0.403**	**4.578**	379.791	-0.1	164.399	**0.126**	**2.379**	5067.295	-0.1	1	-0.1	**0.111**
157	**0.463**	**4.326**	30.463	-0.1	57.371	-0.1	**0.126**	315.435	-0.1	0.9	-0.1	-0.1
158	0.221	**4.326**	23.27	-0.1	59.809	0.032	**0.105**	267.088	-0.1	0.4	-0.1	-0.1
159	0.101	**9.273**	28.106	-0.1	103.474	-0.1	**0.13**	385.616	-0.1	1.1	-0.1	-0.1
160	0.098	**4.268**	15.921	-0.1	42.39	-0.1	**0.085**	241.585	-0.1	0.6	-0.1	-0.1
161	0.057	**5.432**	15.177	-0.1	40.436	-0.1	**0.098**	131.991	-0.1	0.8	-0.1	-0.1
162	0.04	**4.598**	19.917	0.154	87.483	-0.1	-0.1	303.066	-0.1	0.5	0.15	-0.1
163	0.062	**3.88**	33.196	0.175	49.129	0.037	-0.1	130.882	-0.1	0.6	-0.1	-0.1
164	-0.1	**3.686**	23.463	0.16	70.088	-0.1	-0.1	260.099	-0.1	2.3	-0.1	-0.1
165	0.706	**4.753**	26.263	0.231	139.114	-0.1	-0.1	454.198	-0.1	5.2	0.148	-0.1
166	0.026	**3.841**	13.528	0.273	35.274	-0.1	-0.1	528.544	-0.1	0.7	-0.1	-0.1
167	-0.1	**3.531**	13.337	0.294	36.707	-0.1	-0.1	574.704	-0.1	0.6	-0.1	-0.1
168	**0.376**	0.912	53.043	0.663	37.514	**0.092**	-0.1	1169.755	-0.1	2.7	-0.1	-0.1
169	**0.331**	**3.007**	39.671	0.605	34.632	-0.1	-0.1	911.489	-0.1	0.5	-0.1	-0.1
170	0.029	**4.326**	20.579	0.144	47.601	-0.1	-0.1	289.935	-0.1	0.6	-0.1	-0.1
171	-0.1	**2.658**	8.894	-0.1	18.393	-0.1	-0.1	25.66	-0.1	1.4	-0.1	-0.1
172	-0.1	**2.561**	17.382	-0.1	31.974	-0.1	-0.1	47.73	-0.1	1.3	-0.1	-0.1
173	-0.1	**3.977**	31.62	0.194	63.533	-0.1	-0.1	446.066	-0.1	2.3	-0.1	-0.1
174	0.164	**4.152**	41.113	0.216	93.413	-0.1	-0.1	531.922	-0.1	3.5	-0.1	-0.1
175	0.03	**2.658**	91.317	0.755	136.025	0.024	-0.1	1383.815	-0.1	1.3	-0.1	-0.1
176	0.131	**2.425**	37.319	0.275	81.689	0.031	-0.1	790.828	-0.1	**22.5**	-0.1	-0.1
177	-0.1	**3.123**	17.673	0.094	42.718	-0.1	-0.1	194.039	-0.1	3.7	-0.1	-0.1
217	0.045	**5.044**	29.18	-0.1	43.25	-0.1	**0.231**	414.817	-0.1	**16.9**	-0.1	-0.1
218	0.034	**3.007**	1.201	-0.1	18.271	-0.1	-0.1	9.209	-0.1	3	-0.1	-0.1

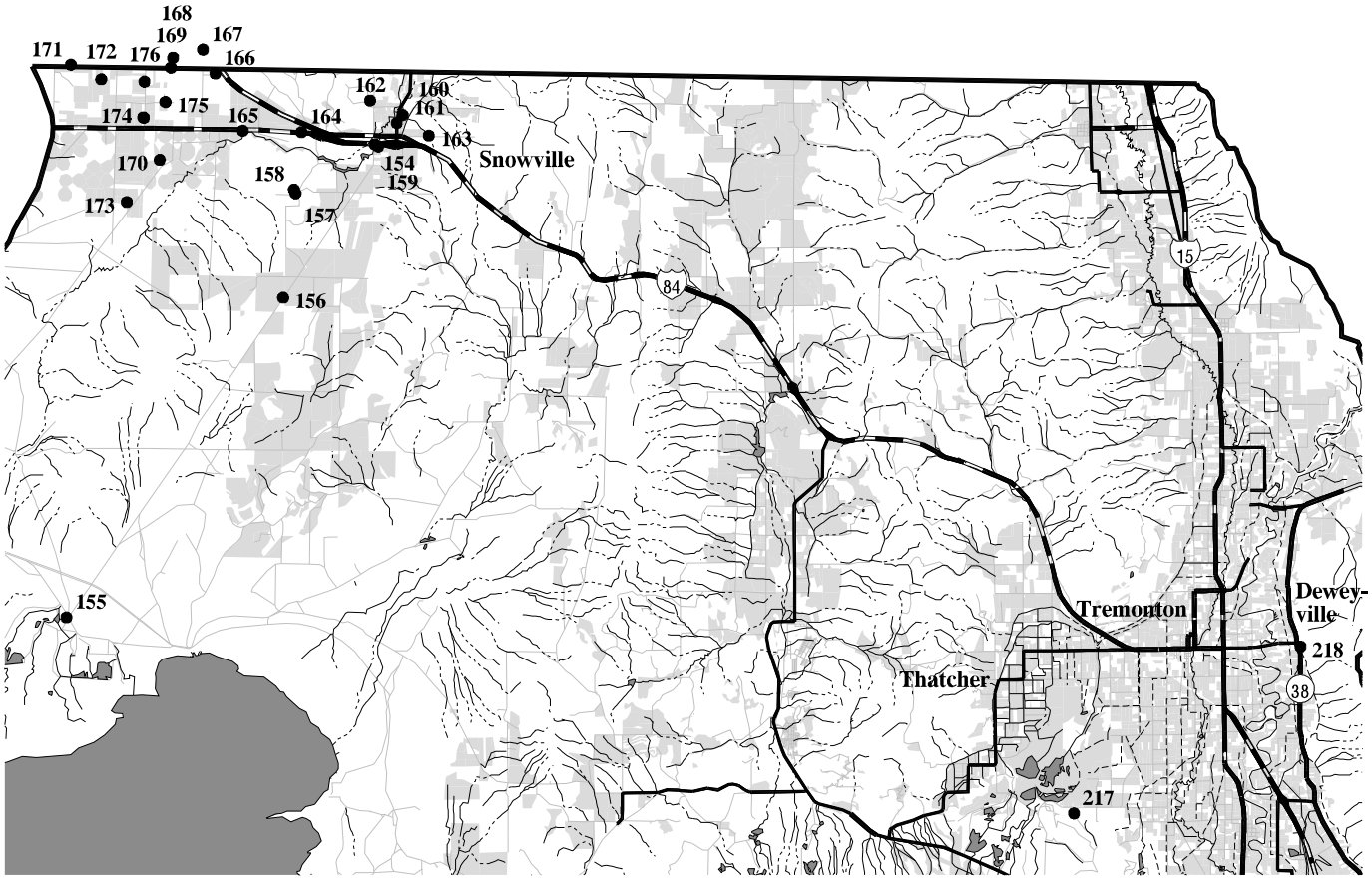
Bolded and shaded values exceed minimum irrigation or livestock standards

Sample Site Test Data for Northern Utah District and Idaho

Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
154	30.478	-0.1	-0.1	-0.1	**3.2**	6	**1**	**1**	18.7	**1282**	7.40
155	33.173	-0.1	-0.1	0.468	**9.7**	11	**1**	**1**	15.8	**3620**	7.30
156	**167.65**	-0.1	-0.1	0.272	**54.2**	32.5	0	0	17.1	**2420**	7.00
157	63.43	-0.1	-0.1	0.044	**6**	10.2	**1**	0	15.6	**2310**	7.00
158	75.207	-0.1	-0.1	0.236	**5**	10.5	**1**	0	18	**2110**	7.00
159	**135.826**	-0.1	-0.1	0.07	**5.6**	17.4	**1**	0	13.3	**2910**	7.00
160	26.072	-0.1	-0.1	0.157	**5.2**	7.9	0	0	15.5	**1699**	7.00
161	24.201	-0.1	-0.1	0.176	2.9	7.9	**1**	0	19.3	**1229**	7.00
162	**134.152**	-0.1	-0.1	0.041	**4.3**	18.3	**1**	0	18.8	**2840**	7.00
163	14.445	-0.1	-0.1	-0.1	**3**	6.6	**1**	0	22.2	**1295**	7.00
164	56.661	-0.1	-0.1	-0.1	**4.3**	13.7	0	0	17.6	**2270**	7.00
165	**219.504**	-0.1	-0.1	0.455	**6**	19.7	**1**	0	20.1	**3370**	7.00
166	16.172	-0.1	-0.1	-0.1	**12.4**	6.7	0	0	22.8	**3070**	7.00
167	19.953	-0.1	-0.1	-0.1	**13.2**	7	**1**	0	21.9	**3340**	7.00
168	4.956	-0.1	-0.1	-0.1	**31.3**	4.8	**1**	**1**	37	**5630**	7.00
169	24.277	-0.1	-0.1	0.27	**20.2**	7.7	0	0	27.8	**5310**	7.00
170	33.357	-0.1	-0.1	-0.1	**5.7**	9.5	**1**	0	17.9	**2040**	7.00
171	8.834	-0.1	-0.1	-0.1	0.7	5.3	**1**	0	16.9	584	7.00
172	8.99	-0.1	-0.1	-0.1	1	9	**1**	0	18.7	**1054**	7.00
173	48.119	-0.1	-0.1	-0.1	**7.3**	14.2	0	0	18.2	**2990**	7.00
174	82.171	-0.1	-0.1	-0.1	**7**	22.4	**1**	0	22	**3690**	7.50
175	34.291	-0.1	-0.1	-0.1	**14.3**	36.2	0	0	25.6	**9520**	7.40
176	39.094	-0.1	-0.1	-0.1	**10.5**	22.2	**1**	0	21.7	**5760**	7.60
177	29.217	-0.1	-0.1	-0.1	**3.6**	11.5	0	0	22.1	**2120**	7.00
217	67.293	-0.1	0.011	0.048	**10**	5.9	**1**	**1**	16	**2590**	7.61
218	4.763	-0.1	-0.1	0.153	0.3	3.4	0	0	17.5	367	7.00

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #4 Northern Utah SCD



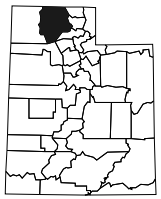
Legend

- *2000 Sample Location*
- *Irrigated Cropland*
- *Water Body*
- *SCD Boundary*
- *Primary Route*
- *Primary Road*
- *Other Road*
- *Perennial Stream*
- *Intermittent Stream*
- *Canal or Ditch*

Map Scale 1:375,904
(1 inch = 5.9 miles)

N

SCD Location



Utah Department of Agriculture and Food GIS January, 2001

Zone 2

Forty-one private individual water-supply sites were sampled in the three districts of Zone 2 during the spring, summer and fall of 2000, with 15 sampled in the Davis District, 14 in the Salt Lake District, and 12 in the Weber District. A separate narrative report is presented for each district as well as data tables and maps showing approximate locations of sampling sites. Each report covers three categories of water quality criteria—irrigation, livestock, and culinary. Since water use may overlap among these categories for a single well, analytical results are compared to all three sets of criteria

Davis District

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected.
Only one well sample in this area exceeds the irrigation standard of 750 μmhos/cm. It is sample number 122, with a value of 926 μmhos/cm.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. None of the wells sampled in this area exceeded the SAR standard.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates, which is common for water in Utah except for sample 51 that contained no detectable bicarbonate.

Sample 53 has elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

No other elements were found to be above concentrations harmful to plants.

Livestock:

All of the sample sites meet livestock quality standards except number 71 which exceeds the arsenic (As) health standard of 0.2 ppm with a value of 0.228.

Culinary:

The water in this area ranges from soft to moderately hard, with GPG (grains per gallon) ranging from 0.8 to 6.0 and a mean of 2.53. Water temperatures ranged from 15.1 to 21.6 and a mean of 18.26 °C. The pH for the area has a mean of 8.10 and ranges from 7.0 to 8.10.

Only well 122 exceeds the EPA aesthetic standard of 833 μmhos/cm for salinity. At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333. None of the wells exceed the primary health standard of 3,333 μmhos/cm.

Two minerals, arsenic (As) and Manganese (Mn), were found to exceed the aesthetic and health drinking water quality standards. Arsenic (As) was found to exceed the primary health standard of 0.05 ppm in samples 66, 68, and 71.

Eight samples have high manganese concentrations—52, 54, 64, 66, 68, 71, 75, and 76. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develop only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminants are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Four samples are contaminated with Coliform—numbers 54, 71, 75, and 122. Sample 71 was also found to be contaminated with E. coli. These wells should be inspected carefully to determine the source of contamination.

Sample Site Test Data for Davis District

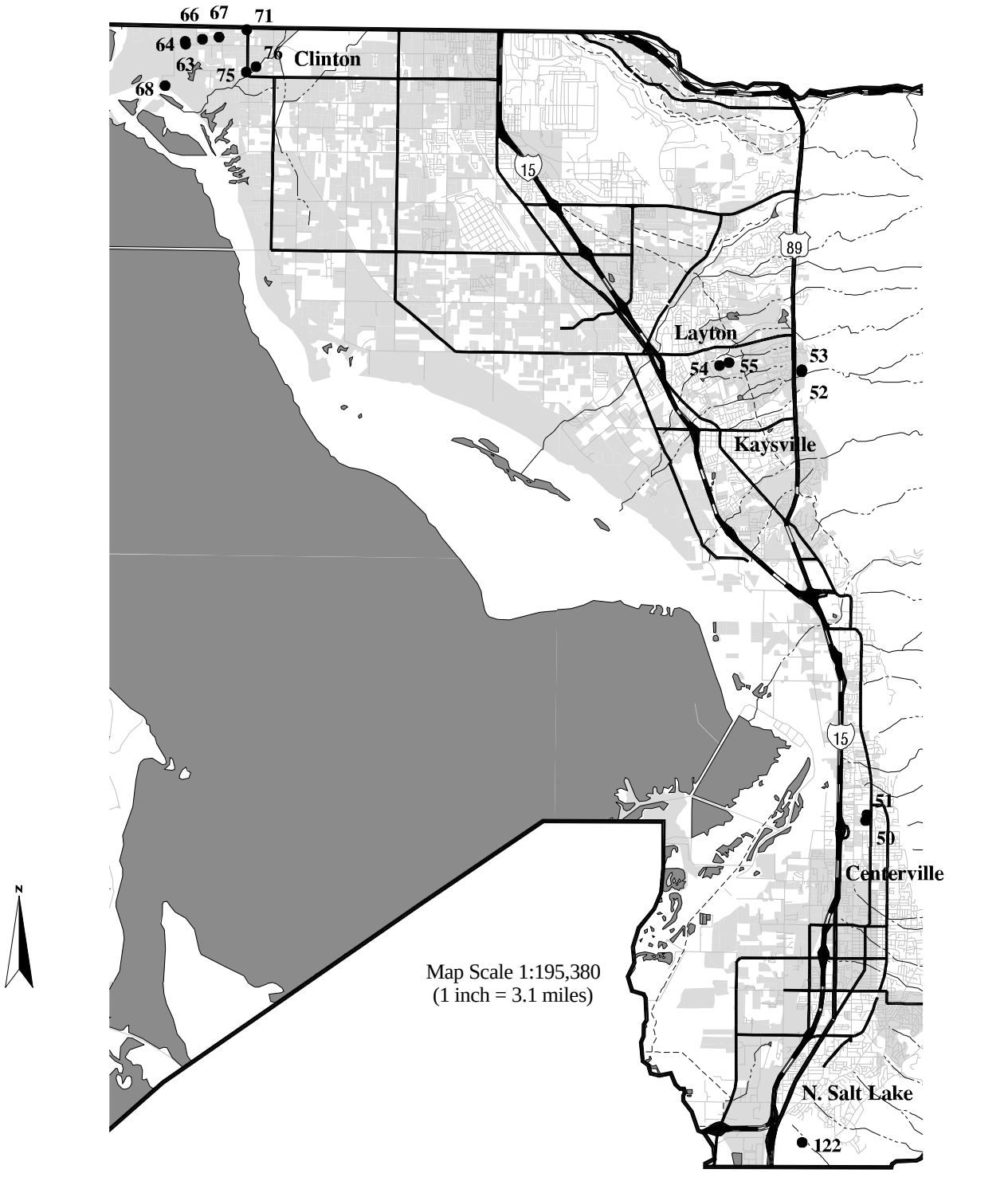
Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
50	-0.1	-0.1	-0.1	0.025	-0.1	20.309	-0.1	16.34	-0.1	-0.1	-0.1	-0.1
51	-0.1	-0.1	-0.1	-0.1	-0.1	12.198	-0.1	14.04	-0.1	-0.1	-0.1	-0.1
52	-0.1	-0.1	-0.1	-0.1	-0.1	22.306	-0.1	10.35	-0.1	-0.1	-0.1	-0.1
53	-0.1	-0.1	-0.1	0.021	-0.1	12.939	-0.1	11.04	-0.1	-0.1	-0.1	-0.1
54	-0.1	-0.1	-0.1	0.027	-0.1	35.008	-0.1	17.39	-0.1	-0.1	-0.1	-0.1
55	-0.1	-0.1	-0.1	0.024	-0.1	39.038	-0.1	16.6	-0.1	-0.1	-0.1	-0.1
63	-0.1	-0.1	-0.1	0.192	-0.1	42.353	-0.1	15.9	-0.1	-0.1	-0.1	-0.1
64	-0.1	-0.1	-0.1	0.303	-0.1	31.119	-0.1	16	-0.1	-0.1	-0.1	-0.1
66	-0.1	**0.071**	0.137	0.344	-0.1	25.955	-0.1	20.56	-0.1	-0.1	-0.1	-0.1
67	-0.1	-0.1	-0.1	0.283	-0.1	32.45	-0.1	16.82	-0.1	-0.1	-0.1	-0.1
68	-0.1	**0.154**	0.196	0.328	-0.1	21.896	-0.1	24.01	-0.1	-0.1	-0.1	-0.1
71	-0.1	**0.228**	0.125	0.191	-0.1	29.322	-0.1	21.96	-0.1	-0.1	-0.1	-0.1
75	-0.1	-0.1	-0.1	0.308	-0.1	40.374	-0.1	16.28	-0.1	-0.1	-0.1	-0.1
76	-0.1	-0.1	-0.1	0.393	-0.1	36.325	-0.1	15.96	-0.1	-0.1	-0.1	-0.1
122	-0.1	-0.1	0.123	0.133	-0.1	82.505	-0.1	127.37	-0.1	-0.1	-0.1	-0.1

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
50	0.021	1.125	1.475	-0.1	9.464	-0.1	-0.1	32.843	-0.1	1.7	-0.1	-0.1
51	0.023	-0.1	1.003	-0.1	5.461	-0.1	-0.1	48.938	-0.1	2.1	0.276	-0.1
52	0.079	**1.921**	0.884	-0.1	8.814	**0.174**	-0.1	10.96	-0.1	4	-0.1	-0.1
53	0.08	**1.901**	0.869	-0.1	1.387	-0.1	**0.028**	37.006	-0.1	0.2	-0.1	-0.1
54	0.083	**3.085**	1.37	-0.1	10.229	**0.063**	-0.1	22.573	-0.1	0.9	-0.1	-0.1
55	0.127	**3.162**	1.323	-0.1	10.461	0.041	-0.1	24.207	-0.1	0.2	-0.1	-0.1
63	-0.1	**6.557**	2.287	-0.1	12.547	-0.1	-0.1	18.811	-0.1	0.8	-0.1	-0.1
64	0.106	**3.007**	3.643	0.058	9.002	**0.077**	-0.1	30.02	-0.1	1.1	-0.1	-0.1
66	0.077	**4.481**	9.049	0.087	18.173	**0.118**	-0.1	45.97	-0.1	0.8	-0.1	-0.1
67	0.156	**3.162**	2.443	-0.1	8.983	0.042	-0.1	29.47	-0.1	0	-0.1	-0.1
68	0.132	**5.335**	9.399	0.089	15.283	**0.145**	-0.1	75.219	-0.1	0.5	0.26	-0.1
71	0.105	**4.753**	8.951	0.088	17.298	**0.061**	-0.1	46.707	-0.1	5.7	-0.1	-0.1
75	0.174	**3.007**	2.415	-0.1	11.675	**0.088**	-0.1	22.637	-0.1	1	-0.1	-0.1
76	0.091	**3.24**	1.997	-0.1	9.904	**0.066**	-0.1	23.211	-0.1	1.1	-0.1	-0.1
122	-0.1	**3.473**	7.095	-0.1	20.671	-0.1	-0.1	70.821	-0.1	1.4	0.141	-0.1

Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
50	6.466	-0.1	-0.1	-0.1	1.5	1.7	0	0	20.8	318	8.30
51	5.986	-0.1	-0.1	-0.1	2.9	1	0	0	18.2	292	8.34
52	3.663	-0.1	-0.1	1.957	0.5	1.8	0	0	21	216	7.40
53	2.601	-0.1	-0.1	1.055	2.6	0.8	0	0	18.7	226	8.42
54	1.374	-0.1	-0.1	-0.1	0.9	2.6	**1**	0	20.2	339	8.12
55	0.393	-0.1	-0.1	-0.1	0.9	2.9	0	0	17.3	363	8.24
63	6.541	-0.1	-0.1	-0.1	0.7	3.2	0	0	21.6	378	8.07
64	0.295	-0.1	-0.1	-0.1	1.2	2.3	0	0	17.5	354	8.16
66	0.188	-0.1	-0.1	-0.1	1.7	2.6	0	0	16	477	8.18
67	1.279	-0.1	-0.1	-0.1	1.2	2.4	0	0	18.8	347	8.22
68	0.176	-0.1	-0.1	-0.1	3	2.2	0	0	17.7	551	8.26
71	0.764	-0.1	-0.1	-0.1	1.7	2.7	**1**	**1**	15.1	506	8.31
75	3.283	-0.1	-0.1	-0.1	0.8	3	**1**	0	18	386	8.21
76	1.408	-0.1	-0.1	-0.1	0.9	2.7	0	0	17.1	358	8.29
122	32.747	-0.1	-0.1	-0.1	1.8	6	**1**	0	15.9	**926**	7.00

Bolded and shaded values exceed minimum irrigation or livestock standards

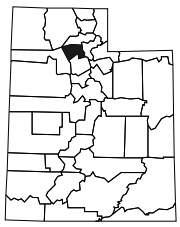
Map #5 Davis County SCD



Legend

- *2000 Sample Location*
- *Irrigated Cropland*
- *Water Body*
- *SCD Boundary*
- *Primary Route*
- *Primary Road*
- *Other Road*
- *Perennial Stream*
- *Intermittent Stream*
- *Canal or Ditch*

SCD Location



Utah Department of Agriculture and Food GIS January, 2001

Salt Lake District

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected. Only four of the 14 samples have EC values less than 750 μmhos/cm. They are samples 81, 125, 126, and 206. None of the samples exceeded the severe-injury level of 3,000 μmhos/cm, which affects most plants.

Sodium adsorption ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. Two of the wells sampled in this district have elevated SAR values—numbers 203 and 204, with values of 3.1 and 3.4, respectively.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates, which is common for water in Utah.

Some specific elements can be toxic to plants. Chlorine, found in the form of Chloride (Cl^-), can damage sensitive plants at concentrations above 145 ppm and concentrations exceeding 355 ppm can cause severe damage to almost all plants. Samples 77, 81, 203, and 204 have elevated chlorine. Using this water in sprinkler irrigation, especially in windy conditions, increases the problem.

Sample 205 has elevated manganese (Mn). Manganese above 0.2 ppm can injure plants and cause reduction in dry matter production. Excess manganese interferes with the plant's ability to use other nutrients such as calcium.

Sample 81 has elevated zinc (Zn) that can cause growth problems in plants at concentrations greater than 2.0 ppm in water. High concentrations of zinc decrease root growth and leaf expansion as well as inhibit the uptake of iron and phosphorus.

Samples 79, 203 through 205, and 207 have elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

No other elements were found in concentrations harmful to plants.

Livestock:

All of the sample sites meet livestock quality standards.

Culinary:

The water in this area ranges from soft to very hard, with GPG (grains per gallon) ranging from 3.0 to 10.9 with a mean of 7.1. Water temperatures ranged from 9.8 to 27.6 and a mean of 16.8 °C. The pH for the area has a mean of 7.51 and ranges from 6.5 to 8.22.

Salinity (EC) for sample sites 81, 82, 125, 126, and 207 did not exceed the EPA aesthetic standard of 833 μmhos/cm. The remaining samples with salinity values above this level may have water off-flavored. This it is not a health problem until the EC level reaches 3,333.

Sample number 125 has elevated arsenic (As). Arsenic at concentrations above 0.05 ppm exceeds EPA's primary drinking water standard.

Only one mineral (manganese) was found to exceed the aesthetic drinking water quality standard. Six samples have high manganese (Mn) concentrations: 77, 78, 81, 125, 203, and 205. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develops only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminants are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problems and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 77, 83, 126, 203, 206 and 207 are contaminated with Coliform. Two samples—126 and 203—were contaminated with E. coli. These wells should be inspected carefully to determine the source of contamination.

Sample Site Test Data for Salt Lake District

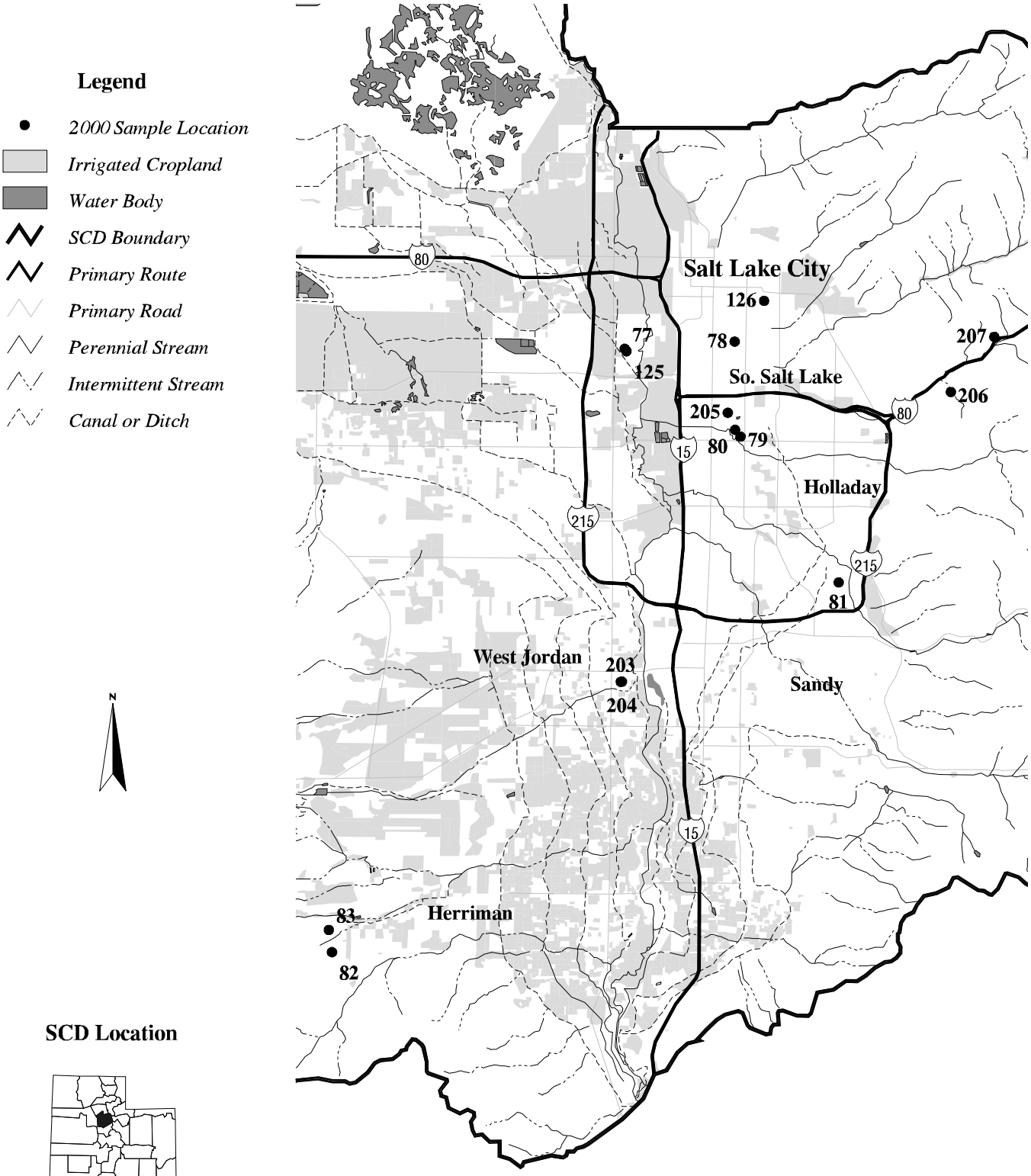
Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
77	0.063	-0.1	0.093	0.182	-0.1	50.037	-0.1	**156.5**	-0.1	-0.1	-0.1	-0.1
78	-0.1	-0.1	0.097	0.043	-0.1	88.26	-0.1	43.82	-0.1	-0.1	-0.1	-0.1
79	-0.1	-0.1	0.071	0.035	-0.1	110.9	-0.1	57.47	-0.1	-0.1	-0.1	-0.1
80	-0.1	-0.1	0.092	0.034	-0.1	124.194	-0.1	92.04	-0.1	-0.1	-0.1	-0.1
81	0.048	-0.1	-0.1	0.036	-0.1	51.124	-0.1	**614.57**	-0.1	-0.1	-0.1	-0.1
82	-0.1	-0.1	0.151	0.064	-0.1	56.432	-0.1	51.1	-0.1	-0.1	-0.1	-0.1
83	-0.1	-0.1	0.105	0.117	-0.1	102.851	-0.1	117.65	-0.1	-0.1	-0.1	-0.1
125	-0.1	**0.057**	0.105	0.039	-0.1	32.043	-0.1	16.28	-0.1	-0.1	-0.1	-0.1
126	0.065	-0.1	-0.1	0.053	-0.1	56.151	-0.1	30.11	-0.1	-0.1	-0.1	-0.1
203	0.048	-0.1	0.326	0.039	-0.1	120.144	-0.1	**234.713**	-0.1	-0.1	-0.1	0.089
204	-0.1	-0.1	0.336	0.035	-0.1	126.752	-0.1	**269.878**	-0.1	-0.1	-0.1	-0.1
205	-0.1	-0.1	0.113	0.05	-0.1	126.9	-0.1	69.171	-0.1	-0.1	-0.1	-0.1
206	-0.1	-0.1	-0.1	0.199	-0.1	63.306	-0.1	11.894	-0.1	-0.1	-0.1	-0.1
207	-0.1	-0.1	0.074	0.056	-0.1	109.783	-0.1	15.737	-0.1	-0.1	-0.1	-0.1

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
77	0.207	**3.22**	12.187	0.113	31.237	**0.111**	-0.1	65.711	-0.1	4.3	-0.1	-0.1
78	0.076	**3.88**	2.807	-0.1	34.74	**0.114**	-0.1	47.874	-0.1	1.3	-0.1	-0.1
79	-0.1	**4.423**	2.735	-0.1	42.146	-0.1	**0.018**	29.642	-0.1	2.7	-0.1	-0.1
80	0.069	**5.645**	2.94	-0.1	44.571	-0.1	-0.1	40.151	-0.1	3	-0.1	-0.1
81	0.045	**2.483**	1.758	-0.1	21.513	**0.168**	-0.1	12.29	-0.1	0.6	-0.1	-0.1
82	0.021	**3.201**	2.26	-0.1	13.743	-0.1	-0.1	75.439	-0.1	1.6	-0.1	-0.1
83	-0.1	**5.102**	5.36	-0.1	31.93	-0.1	-0.1	37.16	-0.1	2.1	-0.1	-0.1
125	0.126	**1.921**	2.767	0.061	18.542	**0.073**	-0.1	60.493	-0.1	1	-0.1	-0.1
126	0.022	**2.949**	1.894	-0.1	13.6	-0.1	-0.1	16.341	-0.1	1.2	-0.1	-0.1
203	0.152	**5.917**	12.927	-0.1	54.075	**0.026**	**0.139**	165.414	-0.1	5.3	-0.1	-0.1
204	0.021	**6.363**	13.24	-0.1	60.34	-0.1	**0.159**	188.49	-0.1	2.5	-0.1	-0.1
205	0.022	**5.296**	4.817	-0.1	38.68	**0.2**	**0.033**	46.701	-0.1	0.6	-0.1	-0.1
206	-0.1	**4.19**	1.274	-0.1	25.089	-0.1	-0.1	14.257	-0.1	0.9	-0.1	-0.1
207	-0.1	**7.353**	1.969	-0.1	40.237	-0.1	**0.013**	21.979	-0.1	1	-0.1	-0.1

Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
77	20.959	-0.1	-0.1	0.044	1.8	4.8	**1**	0	17.2	**922**	8.22
78	59.196	-0.1	-0.1	-0.1	1.1	7.2	0	0	14.7	**876**	8.05
79	75.692	-0.1	-0.1	-0.1	0.6	9	0	0	15.6	**967**	7.84
80	61.241	-0.1	-0.1	-0.1	0.8	9.9	0	0	18.7	**1091**	8.10
81	20.728	-0.1	-0.1	**2.959**	0.4	4.2	0	0	14	491	8.07
82	16.675	-0.1	-0.1	0.218	2.3	4.1	0	0	16.4	**750**	7.93
83	19.117	-0.1	0.011	0.081	0.8	7.9	**1**	0	18.1	**947**	7.88
125	32.325	-0.1	-0.1	-0.1	2.1	3	0	0	15.5	580	7.60
126	16.129	-0.1	-0.1	0.062	0.5	4.1	**1**	**1**	27.6	472	7.50
203	68.097	-0.1	-0.1	0.135	**3.1**	10.2	**1**	**1**	19.1	**1752**	6.50
204	74.271	-0.1	-0.1	-0.1	**3.4**	10.9	1	0	17.7	**1879**	7.00
205	59.526	-0.1	-0.1	-0.1	0.9	9.7	0	0	16.3	**1057**	7.00
206	15.784	-0.1	-0.1	-0.1	0.4	5.2	**1**	0	9.8	531	7.00
207	29.272	-0.1	-0.1	-0.1	0.5	8.8	**1**	0	14.6	**845**	6.50

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #6 Salt Lake SCD



Map Scale 1:250,000
(1 inch = 3.95 miles)

Weber District

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected. None of the samples in this area exceeded the 750 μmhos/cm standard. Also none of the samples exceeded the severe-injury level of 3,000 μmhos/cm, which affects most plants.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. None of the samples from this area exceed the SAR standard.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates, which is common for water in Utah.

Some specific elements can be toxic to plants. Sample 72 has elevated manganese (Mn) at 0.591 ppm. Manganese concentrations above 0.2 ppm can injure plants and cause reduction in dry matter production. Excess manganese interferes with the plant's ability to use other nutrients such as calcium.

Sample 160 has elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

No other elements were found in concentrations harmful to plants.

Livestock:

All of the sample sites meet livestock quality standards.

Culinary:

The water in this area ranges from soft to moderately hard, with GPG (grains per gallon) ranging from 1.5 to 4.3 with a mean of 2.47. Water temperatures ranged from 15.1 to 28.7 and a mean of 22.45 °C. The pH for the area has a mean of 8.18 and ranges from 7.8 to 8.36.

None of the sampled sites exceeds the EPA aesthetic standard of 833 μmhos/cm for salinity . At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333.

Only two minerals (Iron Fe and Manganese Mn) were found to exceed the aesthetic drinking water quality standard. Sample 72 has high iron (Fe). This can cause discoloration of plumbing

fixtures and promote the growth of iron bacteria, which also stains anything that it contacts. Again, this is an aesthetic issue, not a health concern.

Nine samples have high manganese (Mn) concentrations: 56, 59, 60, 62, 65, 70, 72, 73, and 74. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develops only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminates are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 70, 72, and 74 are contaminated with Coliform. Samples 70 and 72 were contaminated with E. coli. These wells should be inspected carefully to determine the source of contamination.

Sample Site Test Data for Weber District

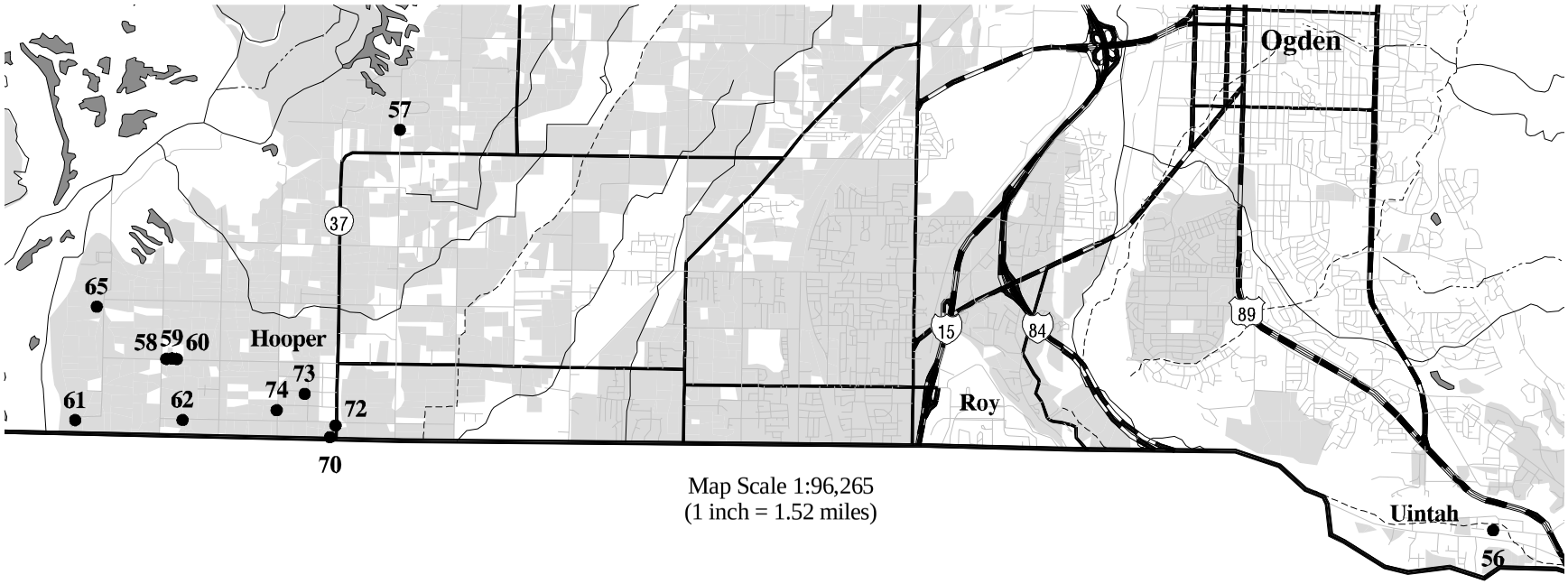
Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
56	-0.1	-0.1	-0.1	0.226	-0.1	59.265	-0.1	26.43	-0.1	-0.1	-0.1	-0.1
57	-0.1	-0.1	-0.1	0.199	-0.1	41.495	-0.1	15.72	-0.1	-0.1	-0.1	-0.1
58	-0.1	-0.1	0.098	0.24	-0.1	19.864	-0.1	21.55	-0.1	-0.1	-0.1	-0.1
59	-0.1	-0.1	0.098	0.636	-0.1	19.254	-0.1	20.56	-0.1	-0.1	-0.1	-0.1
60	-0.1	-0.1	-0.1	0.273	-0.1	39.146	-0.1	17.16	-0.1	-0.1	-0.1	-0.1
61	-0.1	-0.1	-0.1	0.221	-0.1	20.536	-0.1	17.2	-0.1	-0.1	-0.1	-0.1
62	-0.1	-0.1	-0.1	0.38	-0.1	32.797	-0.1	15.08	-0.1	-0.1	-0.1	-0.1
65	-0.1	-0.1	-0.1	0.258	-0.1	33.188	-0.1	14.99	-0.1	-0.1	-0.1	-0.1
70	-0.1	-0.1	-0.1	0.28	-0.1	36.234	-0.1	15.62	-0.1	-0.1	-0.1	-0.1
72	-0.1	-0.1	-0.1	0.186	-0.1	38.691	-0.1	36.2	-0.1	-0.1	-0.1	-0.1
73	-0.1	-0.1	0.073	0.194	-0.1	23.698	-0.1	16.92	-0.1	-0.1	-0.1	-0.1
74	-0.1	-0.1	-0.1	0.242	-0.1	30.98	-0.1	15.16	-0.1	-0.1	-0.1	0.043

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
56	0.077	**4.093**	1.69	-0.1	14.287	**0.463**	-0.1	21.509	-0.1	0.6	-0.1	-0.1
57	-0.1	**3.065**	1.919	-0.1	11.501	-0.1	-0.1	17.474	-0.1	0.6	-0.1	-0.1
58	0.124	**3.22**	3.986	0.056	6.964	0.029	-0.1	49.417	-0.1	0.9	-0.1	-0.1
59	0.09	**3.337**	3.744	0.061	6.867	**0.081**	-0.1	49.858	-0.1	0.9	-0.1	-0.1
60	0.027	**3.026**	2.113	-0.1	10.576	**0.063**	**0.036**	20.233	-0.1	0.7	-0.1	-0.1
61	0.057	**3.143**	3.268	0.055	6.28	0.033	-0.1	46.694	-0.1	1.2	-0.1	-0.1
62	0.077	**3.104**	2.012	-0.1	7.962	**0.072**	-0.1	28.541	-0.1	1.3	-0.1	-0.1
65	0.059	**3.201**	2.508	-0.1	9.316	**0.064**	-0.1	26.086	-0.1	1	-0.1	-0.1
70	0.21	**3.453**	1.895	-0.1	9.138	**0.091**	-0.1	24.269	-0.1	0	-0.1	-0.1
72	**0.358**	**1.921**	2.258	-0.1	10.551	**0.591**	-0.1	14.988	-0.1	0.8	-0.1	-0.1
73	0.165	**3.24**	3.852	0.056	7.467	**0.054**	-0.1	40.036	-0.1	0.9	-0.1	-0.1
74	0.106	**3.22**	1.558	-0.1	7.942	**0.073**	-0.1	30.923	-0.1	0.9	-0.1	-0.1

Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
56	6.484	-0.1	-0.1	-0.1	0.7	4.3	0	0	16.9	477	7.95
57	6.079	-0.1	-0.1	-0.1	0.6	3.1	0	0	27.5	370	8.17
58	0.214	-0.1	-0.1	-0.1	2.4	1.6	0	0	23.4	371	8.32
59	0.208	-0.1	-0.1	-0.1	2.5	1.5	0	0	24.9	361	8.32
60	5.635	-0.1	-0.1	-0.1	0.7	2.9	0	0	20.8	353	8.17
61	0.172	-0.1	-0.1	-0.1	2.3	1.6	0	0	23.4	360	8.21
62	1.631	-0.1	-0.1	-0.1	1.2	2.4	0	0	18.8	345	8.30
65	4.491	-0.1	-0.1	-0.1	1	2.5	0	0	23.3	356	8.17
70	0.359	-0.1	-0.1	0.047	0.9	2.7	**1**	**1**	24.7	333	8.09
72	10.998	-0.1	-0.1	0.117	0.6	2.9	**1**	**1**	21.9	342	7.80
73	0.22	-0.1	-0.1	-0.1	1.8	1.8	0	0	15.1	354	8.36
74	0.233	-0.1	-0.1	-0.1	1.3	2.3	**1**	0	28.7	348	8.27

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #7 Weber SCD



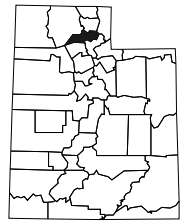
Map Scale 1:96,265
(1 inch = 1.52 miles)

Legend

- *2000 Sample Location*
- *Irrigated Cropland*
- *Water Body*
- *SCD Boundary*
- *Primary Route*
- *Primary Road*
- *Other Road*
- *Perennial Stream*
- *Intermittent Stream*
- *Canal or Ditch*

N

SCD Location



Utah Department of Agriculture and Food GIS January, 2001

Zone 3

Only seven sites were sampled in the three districts of Zone 3 during the spring, summer and fall of 2000. Four were sampled in the Alpine District, one in the Kamas District, and two in the Timp-Nebo District. This report covers all three districts in one report and covering three categories of water quality criteria—irrigation, livestock, and culinary. Since water use may overlap among these categories for a single well, analytical results are compared to all three sets of criteria.

Zone 3 Area (Alpine, Timp-Nebo, & Kamas Valley SCDs)

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (µmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Four samples have EC values greater than 750 µmhos/cm. Samples 84, 210, 211, and 212 with values of 3310, 852, 802, and 843 all have high salinity. One of the samples exceeded the severe-injury level of 3,000 µmhos/cm, which affects most plants (84 with a value 3310).

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. One of the water samples in this area has an elevated SAR value—sample 84, with a value of 3.9.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates, which is common for water in Utah.

Sample 84 has elevated manganese (Mn), at a concentration of 4.609 ppm. Manganese above 0.2 ppm can injure plants and cause reduction in dry matter production. Excess manganese interferes with the plant's ability to use other nutrients such as calcium.

Sample 216 has elevated zinc (4.609) that can cause growth problems in plants at concentrations greater than 2.0 ppm in water. High concentrations of zinc decrease root growth and leaf expansion as well as inhibit the uptake of iron and phosphorus.

No other elements were found in concentrations harmful to plants.

Livestock:

Sample 84 has a sulfur (S) level of 236.94 ppm which exceeds the livestock standard for sulfur. Sulfate can cause water to be off flavored and also diarrhea in animals not used to drinking it. Problems start when the sulfur level in water exceeds 167 ppm.

Culinary:

The water in this area ranges from moderately hard to very hard, with GPG (grains per gallon) ranging from 5.7 to 21.7 with a mean of 8.94. Water temperatures ranged from 12.5 to 25 and a mean of 15.94 °C. The pH for the area has a mean of 7.14 and ranges from 7.0 to 7.29.

Salinity (EC) sample 84, 210, and 212 exceed the EPA aesthetic standard of 833 μmhos/cm. At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333. No samples exceed this level, however sample 84 is close with a value of 3,310.

One sample has a high manganese (Mn) concentration—sample 84, with a value 0.272 ppm. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

Sample 84 also has high sulfur (S), with a value of 236.94 ppm. Sulfate is an anion that can cause flavor problems in drinking water if there is more than 83 ppm of soluble sulfur. Bacteria in the water uses sulfur and produces hydrogen sulfide gas (rotten egg gas). The bacteria that produce this compound can live in plumbing fixtures and even hot water heaters. It is not uncommon to get strong odors when the hot water is turned on in areas where there is high sulfate. Generally, people cannot tolerate the odor from this gas. Even if the gas is not present, high sulfate concentrations can cause diarrhea in people not used to drinking it.

The most serious problem affecting water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develops only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminates are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 211 and 212 are contaminated with Coliform. None of the samples have E. Coli.

Sample Site Test Data for Zone 3 (Alpine Timp-Nebo and Kamas Valley SCD)

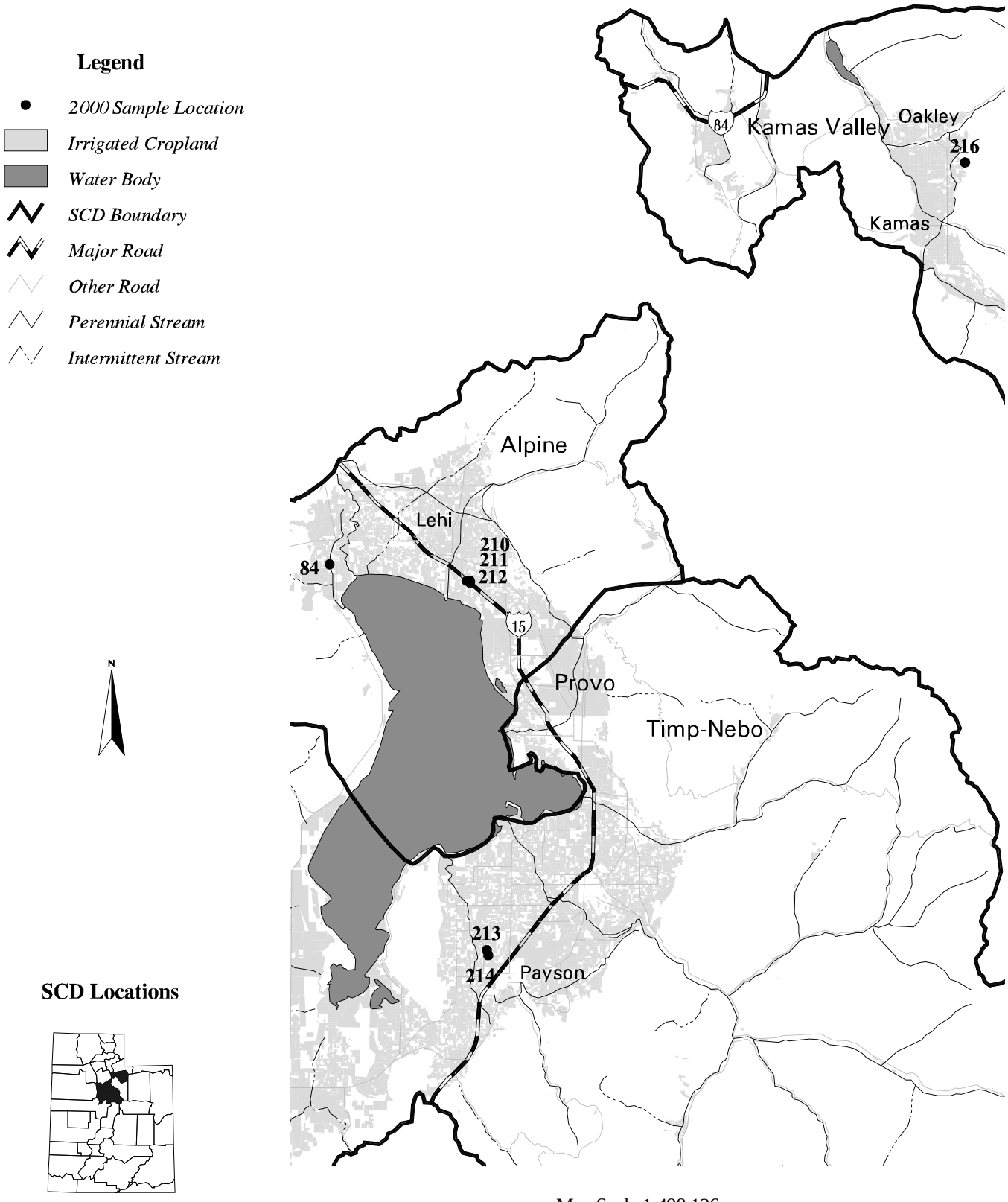
Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
84	-0.1	-0.1	0.485	0.038	-0.1	287.933	-0.1	135.84	-0.1	-0.1	-0.1	-0.1
210	-0.1	-0.1	0.087	0.037	-0.1	87.601	-0.1	13.925	-0.1	-0.1	-0.1	-0.1
211	-0.1	-0.1	0.094	0.176	-0.1	81.825	-0.1	20.951	-0.1	-0.1	-0.1	-0.1
212	-0.1	-0.1	0.098	0.042	-0.1	87.792	-0.1	23.521	-0.1	-0.1	-0.1	-0.1
216	-0.1	-0.1	-0.1	0.078	-0.1	78.995	-0.1	6.668	-0.1	-0.1	-0.1	0.03
213	-0.1	-0.1	-0.1	0.136	-0.1	83.158	-0.1	23.5	-0.1	-0.1	-0.1	-0.1
214	-0.1	-0.1	-0.1	0.118	-0.1	74.392	-0.1	22.459	-0.1	-0.1	-0.1	-0.1

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
84	0.024	**5.122**	26.93	0.967	83.502	**0.272**	-0.1	294.729	-0.1	0.6	-0.1	-0.1
210	-0.1	**5.568**	1.801	-0.1	40.648	-0.1	-0.1	42.493	-0.1	1.3	-0.1	-0.1
211	-0.1	**5.18**	1.773	-0.1	39.659	-0.1	-0.1	37.32	-0.1	1.7	-0.1	-0.1
212	0.028	**5.238**	1.793	-0.1	41.736	-0.1	-0.1	40.127	-0.1	1	-0.1	-0.1
216	0.087	**5.219**	0.961	-0.1	19.161	-0.1	-0.1	14.793	-0.1	0.9	-0.1	-0.1
213	-0.1	**5.587**	8.094	-0.1	33.176	-0.1	-0.1	16.499	-0.1	2.2	-0.1	-0.1
214	-0.1	**4.598**	7.106	-0.1	32.147	-0.1	-0.1	15.672	-0.1	1.9	-0.1	-0.1

Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
84	**236.94**	-0.1	-0.1	-0.1	**3.9**	21.7	0	0	25	**3310**	7.29
210	45.65	-0.1	-0.1	-0.1	0.9	7.5	0	0	16.8	**852**	7.15
211	40.18	-0.1	-0.1	-0.1	0.8	7.1	**1**	0	12.5	**802**	7.10
212	44.27	-0.1	-0.1	-0.1	0.9	7.6	**1**	0	13.3	**843**	7.05
216	2.94	-0.1	-0.1	**4.609**	0.4	5.7	0	0	15.8	550	7.11
213	14.25	-0.1	-0.1	-0.1	0.4	6.8	0	0	13.9	700	7.27
214	13.51	-0.1	-0.1	-0.1	0.4	6.2	0	0	14.3	659	7.00

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #8 Zone 3 (Alpine, Timp-Nebo, and Kamas Valley SCDs)



Map Scale 1:498,126
(1 inch = 7.9 miles)

Zone 4

Twenty-six sites were sampled in the Millard District of Zone 4 during the spring, summer and fall of 2000. One well was sampled in Juab County District of Zone 4, but is not discussed in this report. These wells were sampled as part of an ongoing agreement with the Division of Water Rights, Utah Department of Natural Resources. A narrative report is presented for this area, together with data tables and maps showing approximate locations of sampling sites. The report covers three categories of water quality criteria—irrigation, livestock, and culinary. Since water use may overlap among these categories for a single well, analytical results are compared to all three sets of criteria.

Zone 4 Area (Millard SCD North & South)

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected. Sixteen samples have EC values greater than 750 μmhos/cm (127 through132, 135, 136, 138, through 142, and 145-151). Samples 147, 148, 149 and 151 exceed the severe-injury level of 3,000 μmhos/cm, which affects most plants.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. Samples 147, 148, 149, and 151 have elevated SAR values.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates, which is common for water in Utah except sample 151. None of the samples exceed the 8.5 level.

Samples 147 and 151 have elevated concentrations of manganese (Mn). Manganese above 0.2 ppm can injure plants and cause reduction in dry matter production. It also interferes with the plant's ability to use other nutrients such as calcium.

Samples 147, 148, 149, and 151 have elevated boron (B), which is toxic to sensitive plants when concentration exceeds 0.7 ppm. It will cause severe injury at 10.0 ppm. However, Boron in trace amounts is required for proper plant growth. It is important to monitor this element because the margin separating safe health from toxicity is so small.

Chlorine, found in the form of chloride (Cl^-), can damage sensitive plants at concentrations above 145 ppm and concentrations exceeding 355 ppm can cause severe damage to almost all plants. Samples 128-132, 136, 138, 139, and 140 have elevated chlorine. Using this water in sprinkler irrigation, especially in windy conditions, increases the problem.

Samples 147 and 151 have lithium (Li) that exceeds irrigation standards. Most plants can tolerate lithium in concentrations up to 5 ppm but other plants, such as citrus, show toxicity symptoms at 0.075 ppm. It affects plants similar to how boron does.

Samples 147 and 151 also have elevated concentrations of manganese (Mn). Manganese above 0.2 ppm can injure plants and cause reduction in dry matter production. Excess manganese interferes with the plant's ability to use other nutrients such as calcium.

No other elements were found in concentrations harmful to plants.

Livestock:

Samples 138, 148, and 149 have sulfur (S) concentrations of 168.84, 319.11, and 224.92 ppm which exceeds the livestock standard for sulfur. Sulfate can cause water to be off flavored and can cause diarrhea in animals not used to drinking it. Problems start when the sulfur level in water exceeds 167 ppm.

Culinary:

The water in this area ranges from moderately hard to very hard, with GPG (grains per gallon) ranging from 3.5 to 34.4 with a mean of 9.48. Water temperatures ranged from 14.7 to 34.3 and a mean of 18.31 °C. The pH for the area has a mean of 7.1 and ranges from 8.5 to 7.62.

Salinity (EC) for sixteen sample sites exceed the EPA aesthetic standard of 833 μmhos/cm. At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333. Samples 147, 148, 149, and 151 all exceed the health standard for salinity.

Samples 147 and 151 have high manganese (Mn) concentrations. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

Samples 138, 139, 148, 149, and 151 have high sulfur (S) with values of 168.84, 84.73, 319.11, 224.92, and 109.08 ppm. Sulfate is an anion that can cause flavor problems in drinking water if there is more than 83 ppm of soluble sulfur. Bacteria in the water use sulfur and produce hydrogen sulfide gas (rotten egg gas). The bacteria that produce this compound can live in plumbing fixtures and even hot water heaters. It is not uncommon to get strong odors when the hot water is turned on in areas where there is high sulfate. Generally people cannot tolerate the odor from this gas. Even if the gas is not present, high sulfate concentrations can cause diarrhea in people not used to drinking it.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develop only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminates are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 128, 129, 132, 137, 138, 143, 144, 146, 147, 148, and 151 are contaminated with Coliform. Samples 144 and 147 are contaminated with E. coli. These wells should be inspected carefully to determine the source of contamination.

Sample Site Test Data for Zone 4 (Millard SCD North and South)

Data from listed sample numbers continued on next page

Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Na	Ni
153	-0.1	-0.1	0.134	0.109	-0.1	43.984	-0.1	**204.15**	-0.1	-0.1	136.247	-0.1
127	-0.1	-0.1	0.161	0.084	-0.1	64.163	-0.1	57.24	-0.1	-0.1	78.178	-0.1
128	-0.1	-0.1	0.087	0.039	-0.1	121.945	-0.1	**176.09**	-0.1	-0.1	52.059	-0.1
129	-0.1	-0.1	0.101	0.039	-0.1	149.701	-0.1	**200.64**	-0.1	-0.1	51.361	-0.1
130	-0.1	-0.1	0.102	0.04	-0.1	146.872	-0.1	**167.1**	-0.1	-0.1	48.136	-0.1
131	-0.1	-0.1	0.075	0.082	-0.1	137.922	-0.1	**316.91**	-0.1	-0.1	64.496	-0.1
132	-0.1	-0.1	-0.1	0.167	-0.1	89.666	-0.1	**145.95**	-0.1	-0.1	31.957	-0.1
133	-0.1	-0.1	-0.1	0.212	-0.1	51.715	-0.1	95.83	-0.1	-0.1	24.229	-0.1
134	-0.1	-0.1	-0.1	0.178	-0.1	32.731	-0.1	44.41	-0.1	-0.1	28.337	-0.1
135	-0.1	-0.1	0.072	0.191	-0.1	67.4	-0.1	79.6	-0.1	-0.1	32.181	-0.1
136	-0.1	-0.1	-0.1	0.328	-0.1	75.41	-0.1	**181.96**	-0.1	-0.1	34.3	-0.1
137	-0.1	-0.1	-0.1	0.145	-0.1	50.201	-0.1	44.67	-0.1	-0.1	18.786	-0.1
138	-0.1	-0.1	0.152	0.027	-0.1	161.439	-0.1	**265.389**	-0.1	-0.1	63.952	-0.1
139	-0.1	-0.1	0.29	0.045	-0.1	82.11	-0.1	**204.28**	-0.1	-0.1	124.472	-0.1
140	-0.1	-0.1	0.476	0.075	-0.1	87.492	-0.1	**220.17**	-0.1	-0.1	100.191	-0.1
141	-0.1	-0.1	0.154	0.127	-0.1	105.501	-0.1	140.15	-0.1	-0.1	53.597	-0.1
142	-0.1	-0.1	0.208	0.093	-0.1	107.266	-0.1	128.04	-0.1	-0.1	67.434	-0.1
143	-0.1	-0.1	0.089	0.14	-0.1	68.505	-0.1	34.59	-0.1	-0.1	25.683	-0.1
144	-0.1	-0.1	-0.1	0.108	-0.1	46.973	-0.1	24.36	-0.1	-0.1	14.89	-0.1
145	-0.1	-0.1	0.106	0.163	-0.1	93.457	-0.1	58.79	-0.1	-0.1	31.632	-0.1
146	-0.1	-0.1	0.244	0.079	-0.1	73.243	-0.1	61.01	-0.1	-0.1	54.85	-0.1
147	-0.1	-0.1	**2.209**	0.033	-0.1	39.413	-0.1	-0.1	-0.1	-0.1	731.514	-0.1
148	-0.1	-0.1	**2.859**	0.041	-0.1	413.631	-0.1	-0.1	-0.1	-0.1	712.369	-0.1
149	-0.1	-0.1	**1.342**	0.073	-0.1	320.905	-0.1	-0.1	-0.1	-0.1	435.004	-0.1
150	-0.1	-0.1	0.226	0.116	-0.1	72.597	-0.1	105.58	-0.1	-0.1	45.393	-0.1
151	-0.1	-0.1	**2.519**	-0.1	-0.1	84.476	-0.1	-0.1	-0.1	-0.1	824.534	-0.1
152	-0.1	-0.1	0.198	0.081	-0.1	74.342	-0.1	34.29	-0.1	-0.1	34.698	-0.1
153	-0.1	-0.1	0.134	0.109	-0.1	43.984	-0.1	**204.15**	-0.1	-0.1	136.247	-0.1

Bolded and shaded values exceed minimum irrigation or livestock standards

Sample Site Test Data for Zone 4 (Millard SCD North and South)

Data from listed sample numbers continued on next page

Sample	NO3-N	P	Pb	S	Se	V	Cr	Cu	Fe	HCO3	K	Li
153	1.7	-0.1	-0.1	11.746	-0.1	-0.1	-0.1	-0.1	0.132	**3.259**	9.731	-0.1
127	0.6	-0.1	-0.1	14.974	-0.1	-0.1	-0.1	-0.1	-0.1	**7.896**	1.661	-0.1
128	7.1	-0.1	-0.1	27.695	-0.1	-0.1	-0.1	-0.1	0.022	**5.083**	3.214	0.057
129	5.7	-0.1	-0.1	54.139	-0.1	-0.1	-0.1	-0.1	-0.1	**5.354**	3.792	0.075
130	4.8	-0.1	-0.1	77.727	-0.1	-0.1	-0.1	-0.1	-0.1	**4.85**	3.404	0.06
131	5.1	-0.1	-0.1	45.174	-0.1	-0.1	-0.1	-0.1	-0.1	**5.898**	2.555	-0.1
132	7	-0.1	-0.1	9.217	-0.1	-0.1	-0.1	-0.1	0.021	**4.54**	1.498	-0.1
133	1.9	-0.1	-0.1	3.136	-0.1	-0.1	-0.1	-0.1	0.047	**3.822**	3.046	-0.1
134	1.2	-0.1	-0.1	5.137	-0.1	0.01	-0.1	-0.1	-0.1	**4.656**	1.867	-0.1
135	1.3	-0.1	-0.1	9.917	-0.1	-0.1	-0.1	-0.1	-0.1	**4.656**	1.649	-0.1
136	2.3	-0.1	-0.1	15.723	-0.1	-0.1	-0.1	-0.1	-0.1	**2.367**	1.892	-0.1
137	1.9	-0.1	-0.1	3.982	-0.1	-0.1	-0.1	-0.1	-0.1	**4.307**	1.442	-0.1
138	2.4	-0.1	-0.1	**168.844**	-0.1	-0.1	-0.1	-0.1	-0.1	**3.259**	4.507	0.13
139	0.9	-0.1	-0.1	**84.726**	-0.1	-0.1	-0.1	-0.1	0.043	**4.016**	13.792	0.509
140	1.1	-0.1	-0.1	28.792	-0.1	-0.1	-0.1	-0.1	-0.1	**3.996**	13.433	0.42
141	2.9	-0.1	-0.1	36.165	-0.1	-0.1	-0.1	-0.1	-0.1	**4.132**	2.968	0.056
142	2.6	-0.1	-0.1	37.898	-0.1	-0.1	-0.1	-0.1	-0.1	**5.219**	3.193	0.052
143	1.7	-0.1	-0.1	8.829	-0.1	-0.1	-0.1	-0.1	-0.1	**4.792**	1.917	-0.1
144	0.6	-0.1	-0.1	7.909	-0.1	-0.1	-0.1	-0.1	0.119	**5.917**	1.303	-0.1
145	1.4	-0.1	-0.1	14.431	-0.1	-0.1	-0.1	-0.1	-0.1	**6.13**	2.177	-0.1
146	2.2	-0.1	-0.1	20.335	-0.1	-0.1	-0.1	-0.1	-0.1	**7.256**	2.196	0.084
147	2.2	0.139	-0.1	0.407	-0.1	-0.1	-0.1	-0.1	0.294	**7.566**	69.641	**2.702**
148	2	-0.1	-0.1	**319.106**	-0.1	-0.1	-0.1	-0.1	-0.1	**5.801**	59.733	2.369
149	1.8	-0.1	-0.1	**224.924**	-0.1	-0.1	-0.1	-0.1	0.021	**4.268**	40.183	1.585
150	2	-0.1	-0.1	16.604	-0.1	-0.1	-0.1	-0.1	-0.1	**4.229**	6.871	0.118
151	1.3	-0.1	-0.1	**109.082**	-0.1	-0.1	-0.1	-0.1	0.075	0.854	99.274	**3.745**
152	0	-0.1	-0.1	9.802	-0.1	-0.1	-0.1	-0.1	0.036	**5.529**	3.089	-0.1
153	1.7	-0.1	-0.1	11.746	-0.1	-0.1	-0.1	-0.1	0.132	**3.259**	9.731	-0.1

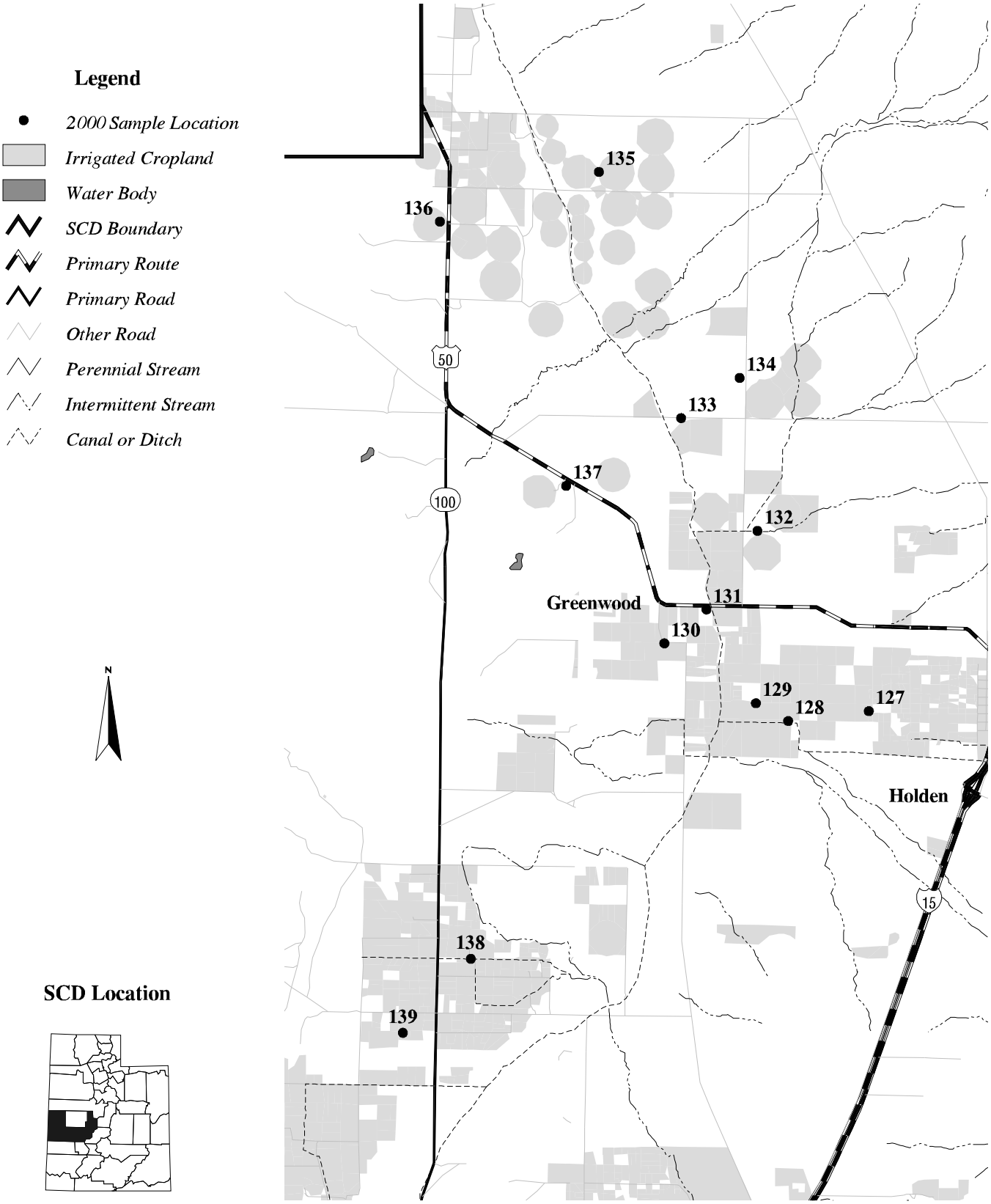
Bolded and shaded values exceed minimum irrigation or livestock standards

Sample Site Test Data for Zone 4 (Millard SCD North and South)

Sample	Mg	Mn	Mo	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
153	21.961	-0.1	-0.1	-0.1	**4.2**	**3.9**	0	0	21	**1032**	7.8
127	33.597	-0.1	-0.1	-0.1	2	5.7	0	0	15.8	**876**	7.2
128	44.524	-0.1	-0.1	-0.1	1	9.7	**1**	0	16	**1237**	7.3
129	49.509	-0.1	-0.1	-0.1	0.9	11.6	**1**	0	16.2	**1387**	7.4
130	57.721	-0.1	-0.1	0.062	0.9	12	0	0	16.6	**1378**	7.3
131	72.271	-0.1	-0.1	-0.1	1.1	12.3	0	0	14.9	**1646**	7.1
132	45.667	-0.1	-0.1	-0.1	0.7	7.9	**1**	0	15.2	**996**	7.5
133	35.744	-0.1	-0.1	0.04	0.6	5.1	0	0	21.1	692	7.8
134	26.346	-0.1	-0.1	0.042	0.9	3.5	0	0	20.7	512	8
135	32.489	-0.1	-0.1	-0.1	0.8	5.8	0	0	17.6	**750**	7.7
136	35.485	-0.1	-0.1	-0.1	0.8	6.5	0	0	18.6	**889**	7.9
137	30.707	-0.1	-0.1	-0.1	0.5	4.7	**1**	0	19.1	576	7.7
138	116.549	-0.1	-0.1	-0.1	0.9	16.3	**1**	0	21.6	**1913**	7.7
139	56.721	-0.1	-0.1	-0.1	2.6	8.1	0	0	21.5	**1480**	7.8
140	30.042	-0.1	-0.1	-0.1	2.4	6.9	0	0	17.4	**1220**	7.7
141	29.713	-0.1	-0.1	0.081	1.2	7.9	0	0	15.1	**1039**	7.7
142	32.839	-0.1	-0.1	-0.1	1.5	8.2	0	0	14.7	**1108**	7.6
143	21.089	-0.1	-0.1	-0.1	0.7	5.2	**1**	0	17.2	616	7.6
144	20.769	0.024	-0.1	-0.1	0.5	4	**1**	**1**	34.3	475	8.1
145	34.615	-0.1	-0.1	-0.1	0.7	7.5	0	0	15.4	**842**	7.6
146	26.317	-0.1	-0.1	-0.1	1.4	5.8	**1**	0	21.8	**814**	7.1
147	81.911	**0.253**	-0.1	-0.1	**15.2**	7.1	**1**	**1**	17.1	**5200**	8.5
148	174.821	-0.1	-0.1	-0.1	**7.4**	34.4	**1**	0	15.4	**5960**	7.2
149	188.936	-0.1	-0.1	-0.1	**4.8**	29.8	0	0	17.8	**4730**	7.4
150	33.61	-0.1	-0.1	-0.1	1.1	6.2	0	0	16.4	**824**	7.8
151	61.602	**1.129**	-0.1	-0.1	**16.6**	8.5	**1**	0	22.2	**4980**	7.7
152	25.614	-0.1	-0.1	0.401	0.9	5.8	0	0	16.4	667	7.6
153	21.961	-0.1	-0.1	-0.1	**4.2**	**3.9**	0	0	21	**1032**	7.8

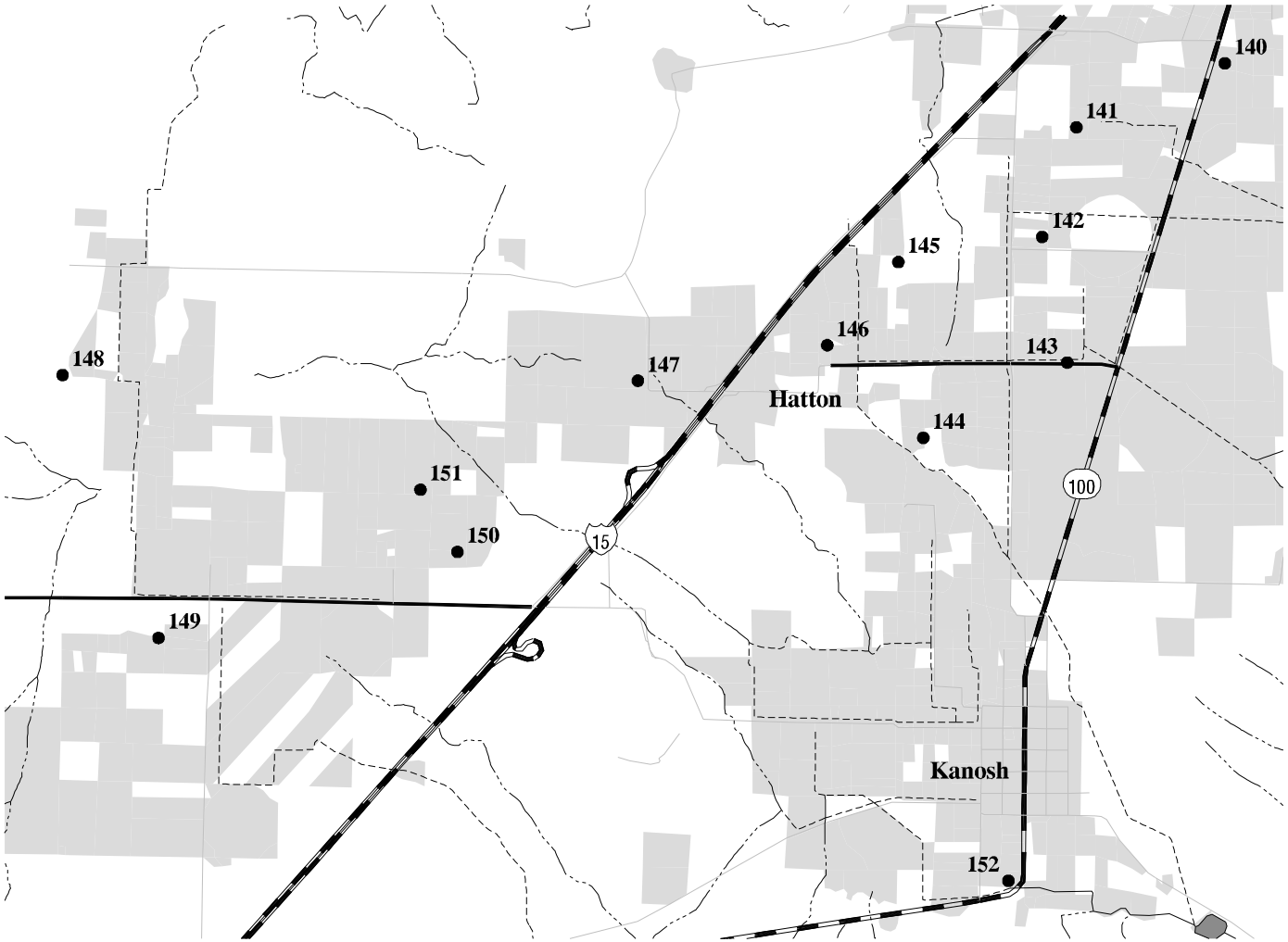
Bolded and shaded values exceed minimum irrigation or livestock standards

Map #9A Millard SCD (North)



Map Scale 1:120,384
(1 inch = 1.9 miles)

Map #9B Millard SCD (South)



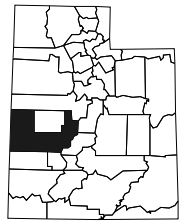
Legend

- *2000 Sample Location*
- *Irrigated Cropland*
- *Water Body*
- *SCD Boundary*
- *Primary Route*
- *Primary Road*
- *Other Road*
- *Perennial Stream*
- *Intermittent Stream*
- *Canal or Ditch*

Map Scale 1:77,888
(1 inch = 1.23 miles)

N

SCD Location



Utah Department of Agriculture and Food GIS January, 2001

Zone 5

Seventy-four sites were sampled in the five districts of Zone 5 during the spring, summer and fall of 2000. Fourteen wells were sampled in the Canyonlands District, three in the Dixie District, five in "E & I", district, seven in the Kane District, and forty-five in the Upper Sevier District. A separate narrative report is presented for each district except for Dixie and "E & I", which are combined into one report. In addition to a narrative, these reports include data tables and maps showing locations of sample sites. Each report covers three categories of water quality criteria—irrigation, livestock, and culinary. Since water use may overlap among these categories for a single well, analytical results are compared to all three sets of criteria.

Canyonlands District

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected. Seven samples have EC values greater than 750 μmhos/cm. Samples 118, 119, 120, 242, 243, 244, and 252 with values of ranging from 455 to 11,210. Sample 243 with a value of 11,210 exceeds the severe-injury level of 3,000 μmhos/cm, which affects most plants.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. Samples 118, 119, 242, 243, and 244 have elevated SAR values. Sample 243 has a SAR value of 18.1, which exceeds the most severe standard.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage to plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates, which is common for water in Utah. Samples 242 and 243 exceed the 8.5 level.

Some specific elements can be toxic to plants. Sample 243 has elevated boron (B), which is toxic to sensitive plants when it exceeds 0.7 ppm. It causes severe injury at 10.0 ppm. However, Boron in trace amounts is required for proper plant growth. It is important to monitor this element because the margin separating safe health from toxicity is so close.

Chlorine, found in the form of chloride (Cl^-), can damage sensitive plants at concentrations above 145 ppm and concentrations exceeding 355 ppm can cause severe damage to almost all plants. A sample 243 has elevated chlorine of 307.76 ppm, respectively. Using this water in sprinkler irrigation, especially in windy conditions, increases the problem.

Samples 118, 242, and 243 have elevated concentrations of manganese (Mn). Manganese above 0.2 ppm can injure plants and cause reduction in dry matter production. Excess manganese interferes with the plant's ability to use other nutrients such as calcium.

Samples 118, 242, 243, 244, 245, 248, 251, and 252 have elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

Samples 243, 247, and 249 have elevated zinc (Zn) that can cause growth problems in plants when it is greater than 2.0 ppm in water. A high concentration of zinc decreases root growth and leaf expansion as well as inhibits the uptake of iron and phosphorus.

No other elements were found in concentrations harmful to plants.

Livestock:

Sulfate (SO4) is shown on chemical analyses for sulfur (S). Sulfur in water would be in the sulfate form so the assumption is made that all detected sulfur is sulfate. Sulfate can cause water to be off flavored and can cause diarrhea in animals not used to drinking it. Problems start when the sulfur level in water exceeds 167 ppm. Samples 118, 119, 120 and 243 all have elevated sulfur.

Electrical Conductivity (EC) is the measure of salts in water. When the value exceeds 8,332 μmhos /cm. Usually livestock will not drink water of this quality unless forced. Sample 243 exceeds the salinity standard for livestock.

Culinary:

The water in this area ranges from moderately hard to very hard, with GPG (grains per gallon) ranging from 4.1 to 58.5 with a mean of 12.73. Water temperatures ranged from 11 to 27 and a mean of 17.81 °C. The pH for the area has a mean of 7.63 and ranges from 7.0 to 8.1.

Salinity (EC) for sample sites 118, 119, 120, 242, 243, and 244 exceeds the EPA aesthetic standard of 833 μmhos/cm. At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333. Samples 119, 120, and 243 exceed the health standard.

Several minerals were found to exceed the aesthetic drinking water quality standard. Samples 243 and 245 have high iron (Fe). This can cause discoloration of plumbing fixtures and promote the growth of iron bacteria, which also stains anything that it contacts. Again, this is an aesthetic issue, not a health concern.

Samples 118, 242, 243, 244, and 245 have high manganese (Mn) concentrations. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

Samples 118, 119, 120, and 243 also have high sulfur. Sulfate is an anion that can cause flavor problems in drinking water if there is more than 83 ppm of soluble sulfur. Bacteria in the water use sulfur and produce hydrogen sulfide gas (rotten egg gas). The bacteria that produce this compound can live in plumbing fixtures and even hot water heaters. It is not uncommon to get strong odors when the hot water is turned on in areas where there is high sulfate. Generally people can not tolerate the odor from this gas. Even if the gas is not present, high sulfate concentrations can cause diarrhea in people not used to drinking it.

Sample 243 has elevated zinc (Zn). EPA has set an aesthetic standard for zinc at 5.0 ppm because it may produce an unpleasant astringent taste in the water.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develop only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminates are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 118, 119, 243, 244, and 247 are contaminated with Coliform. No samples were found to be contaminated with E. coli.

Sample Site Test Data for Canyonlands District

Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
118	-0.1	-0.1	0.435	-0.1	-0.1	564.683	-0.1	87.5	-0.1	-0.1	-0.1	-0.1
119	-0.1	-0.1	0.262	0.033	-0.1	102.562	-0.1	14.97	-0.1	-0.1	-0.1	-0.1
120	0.04	-0.1	0.228	0.031	-0.1	181.823	-0.1	26.16	-0.1	-0.1	-0.1	0.033
242	0.056	-0.1	0.386	0.031	-0.1	40.765	-0.1	76.648	-0.1	-0.1	-0.1	-0.1
243	-0.1	-0.1	**0.72**	0.033	-0.1	407.191	-0.1	**307.761**	-0.1	-0.1	-0.1	-0.1
244	-0.1	-0.1	0.191	0.054	-0.1	48.854	-0.1	18.562	-0.1	-0.1	-0.1	0.029
245	-0.1	-0.1	0.126	0.042	-0.1	51.577	-0.1	6.749	-0.1	-0.1	-0.1	-0.1
246	-0.1	-0.1	0.094	0.184	-0.1	60.197	-0.1	9.617	-0.1	-0.1	-0.1	0.024
247	-0.1	-0.1	-0.1	0.081	-0.1	56.93	-0.1	7.523	-0.1	-0.1	-0.1	0.026
248	-0.1	-0.1	0.093	0.116	-0.1	63.632	-0.1	7.426	-0.1	-0.1	-0.1	0.02
249	-0.1	-0.1	0.084	0.138	-0.1	61.93	-0.1	14.413	-0.1	-0.1	-0.1	0.031
250	-0.1	-0.1	-0.1	0.034	-0.1	54.776	-0.1	-0.1	-0.1	-0.1	-0.1	0.033
251	-0.1	-0.1	-0.1	0.185	-0.1	85.843	-0.1	9.793	-0.1	-0.1	-0.1	-0.1
252	-0.1	-0.1	0.084	-0.1	-0.1	65.184	-0.1	17.77	-0.1	-0.1	-0.1	-0.1

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
118	0.073	**7.954**	6.115	0.306	179.385	**0.819**	**0.359**	920.339	-0.1	0	-0.1	-0.1
119	0.31	**6.635**	4.965	0.123	49.669	-0.1	-0.1	202.538	-0.1	0.1	-0.1	-0.1
120	0.025	**8.032**	6.7	0.135	88.513	-0.1	-0.1	69.687	-0.1	2.1	-0.1	-0.1
242	0.035	**8.769**	8.021	-0.1	32.892	**0.278**	**0.097**	238.822	-0.1	-0.1	-0.1	-0.1
243	**2.318**	**12.222**	50.86	-0.1	592.813	**0.224**	**1.4**	2445.842	-0.1	3.5	-0.1	-0.1
244	0.151	**7.159**	3.958	-0.1	21.747	**0.09**	**0.047**	135.735	-0.1	1.1	-0.1	-0.1
245	**1.05**	**4.074**	3.207	-0.1	31.008	**0.107**	**0.037**	43.81	-0.1	0.6	-0.1	-0.1
246	0.02	**5.568**	10.353	-0.1	33.026	-0.1	-0.1	18.559	-0.1	1.7	0.177	-0.1
247	0.055	**3.996**	2.65	-0.1	16.887	-0.1	-0.1	11.786	-0.1	1.2	-0.1	-0.1
248	-0.1	**5.316**	4.415	-0.1	24.509	-0.1	**0.011**	16.831	-0.1	1	-0.1	-0.1
249	-0.1	**5.044**	6.319	-0.1	34.358	-0.1	-0.1	17.872	-0.1	0.5	-0.1	-0.1
250	0.032	**3.822**	2.398	-0.1	21.326	-0.1	-0.1	12.116	-0.1	0.9	-0.1	-0.1
251	-0.1	**5.839**	1.528	-0.1	29.408	-0.1	**0.013**	15.821	-0.1	1	-0.1	-0.1
252	0.087	**7.081**	3.506	-0.1	45.73	-0.1	**1**	32.016	-0.1	0.8	-0.1	-0.1

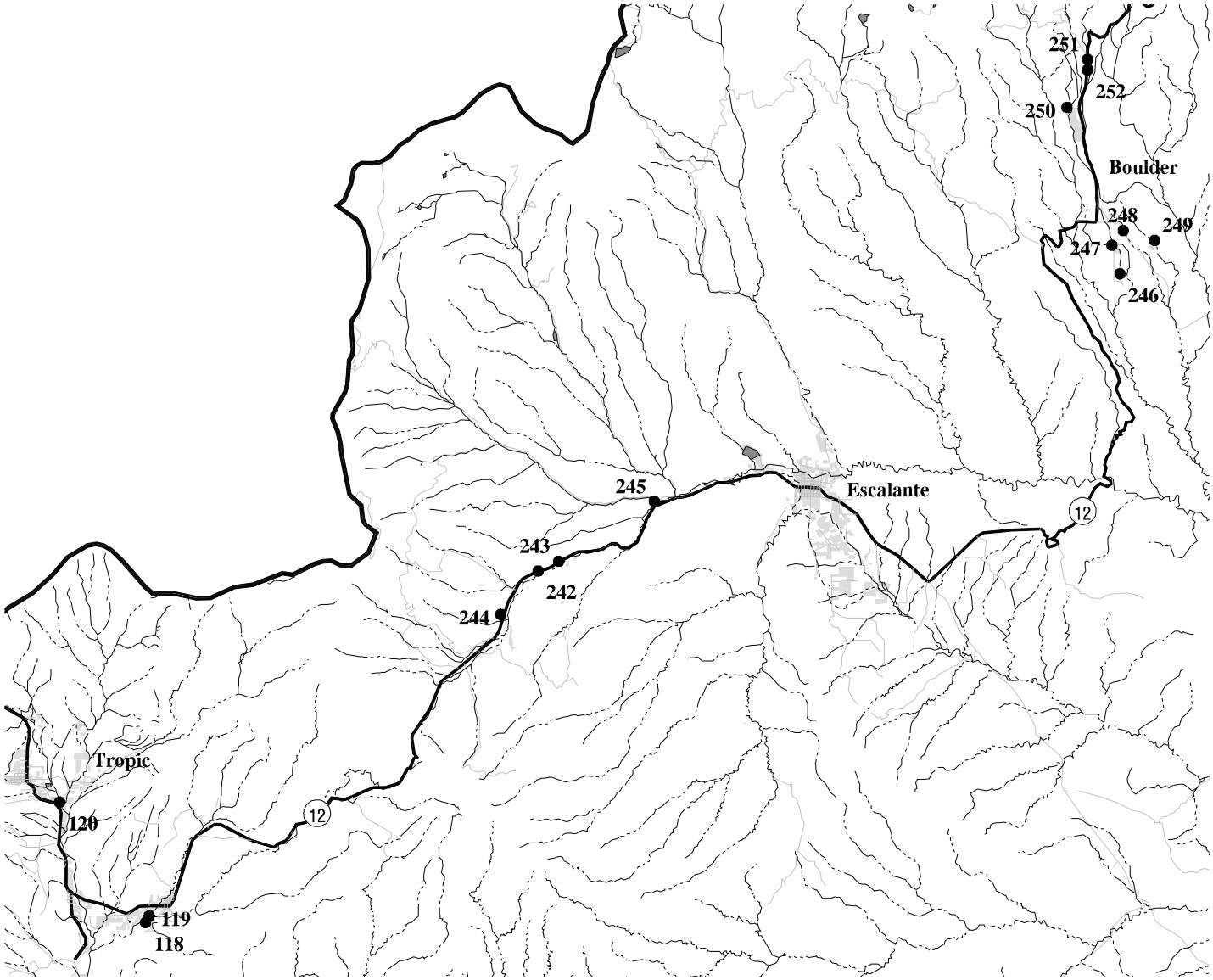
Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
118	**999.095**	-0.1	-0.1	0.727	**8.6**	43.5	**1**	0	21.8	**2570**	7.00
119	**173.026**	-0.1	-0.1	0.183	**4.1**	8.9	**1**	0	23.9	**7340**	7.00
120	**169.605**	-0.1	-0.1	0.108	1.1	15.8	0	0	17.9	**7120**	7.00
242	72.087	-0.1	-0.1	0.21	**6.7**	4.3	0	0	12.6	**1410**	7.70
243	**1513.639**	-0.1	-0.1	**8.423**	**18.1**	58.5	**1**	0	15.2	**11210**	7.30
244	39.017	-0.1	-0.1	-0.1	**4.1**	4.1	**1**	0	15.4	**932**	7.80
245	21.383	-0.1	-0.1	0.05	1.2	4.8	0	0	13.9	656	7.80
246	7.257	-0.1	-0.1	-0.1	0.5	5.5	0	0	20.3	624	8.00
247	7.986	-0.1	-0.1	**2.876**	0.4	4.3	**1**	0	17.3	455	8.00
248	8.624	-0.1	-0.1	0.079	0.5	5.2	0	0	27	560	8.00
249	22.086	-0.1	-0.1	**3.654**	0.5	5.6	0	0	17.6	630	7.80
250	16.261	-0.1	-0.1	0.081	0.4	4.5	0	0	19.7	469	8.10
251	22.592	-0.1	-0.1	-0.1	0.4	6.7	0	0	15.8	693	7.60
252	9.285	-0.1	0.012	0.135	0.7	6.5	0	0	11	**796**	7.70

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #10 Canyonlands SCD

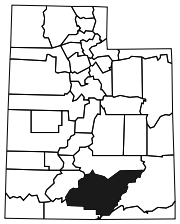
Legend

- *2000 Sample Location*
- *Irrigated Cropland*
- *Water Body*
- *SCD Boundary*
- *Primary Route*
- *Primary Road*
- *Other Road*
- *Perennial Stream*
- *Intermittent Stream*
- *Canal or Ditch*



N

SCD Location



Map Scale 1:348,480
(1 inch = 5.5 miles)

Utah Department of Agriculture and Food GIS January, 2001

Dixie and "E & I" Districts

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected. Seven samples have EC values greater than 750 μmhos/cm. Samples 368, 369, and 370 have elevated salinity with values of ranging from 871 to 1313. No samples exceed the severe-injury level of 3,000 μmhos/cm, which affects most plants.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. Sample 369 has an elevated SAR, with a value of 4.2.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates, which is common for water in Utah.

Some specific elements can be toxic to plants. Sample 369 has elevated Boron (B) which is toxic to sensitive plants when it exceeds 0.7 ppm. It will cause severe injury at 10.0 ppm. However, Boron in trace amounts is required for proper plant growth. It is important to monitor this element because the margin separating safe health from toxicity is so small.

Samples 368, 369, 370, 364, 365, and 367 have elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

Sample 369 has elevated zinc (Zn) that can cause growth problems in plants when it is greater than 2.0 ppm in water. High concentrations of zinc decrease root growth and leaf expansion as well as inhibit the uptake of iron and phosphorus.

No other elements were found in concentrations harmful to plants.

Livestock:

Sulfate (SO4) is shown on chemical analyses for sulfur (S). Sulfur in water would be in the sulfate form so the assumption is made that all detected sulfur is sulfate. Sulfate can cause water to be off flavored and also causes diarrhea in animals not used to drinking it. Problems start when the sulfur level in water exceeds 167 ppm. Sample 369 has elevated sulfur.

Culinary:

The water in this area ranges from moderately hard to hard, with GPG (grains per gallon) ranging from 5.8 to 10.4 with a mean of 7.39. Water temperatures ranged from 7 to 14.4 and a mean of 10.56 °C. The pH for the area has a mean of 7.64 and ranges from 7.33 to 8.24.

Salinity (EC) for sample sites 368, 369, and 370 exceeds the EPA aesthetic standard of 833 μmhos/cm. At this level the water may be off-flavored, but it is not a health problem until the EC level reaches 3,333. No samples exceeded the health standard.

Sample 368 has high sulfur (S). Sulfate is an anion that can cause flavor problems in drinking water if there is more than 83 ppm of soluble sulfur. Bacteria in the water use sulfur and produce hydrogen sulfide gas (rotten egg gas). The bacteria that produce this compound can live in plumbing fixtures and even hot water heaters. It is not uncommon to get strong odors when the hot water is turned on in areas where there is high sulfate. Generally people can not tolerate the odor from this gas. Even if the gas is not present, high sulfate concentrations can cause diarrhea in people not used to drinking it.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform can occur in the soil, whereas E. coli develop only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminates are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 368, 363, 364, 366, and 367 are contaminated with Coliform. No samples were found to be contaminated with E. coli.

Sample Site Test Data for Dixie and "E and I" Districts

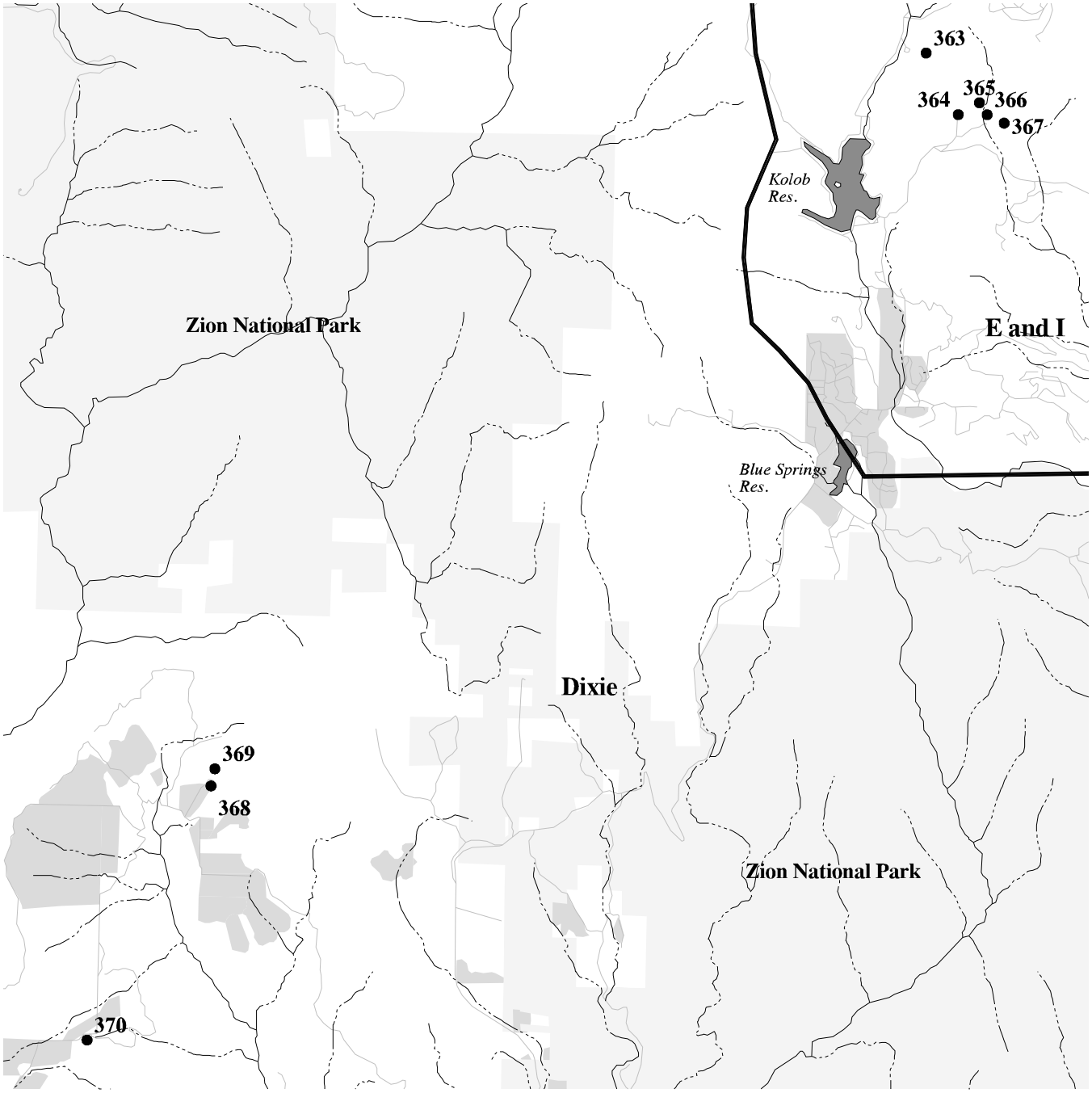
Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
368	-0.1	-0.1	0.215	0.091	-0.1	83.023	-0.1	23.258	-0.1	-0.1	-0.1	-0.1
369	0.041	-0.1	**0.787**	0.027	-0.1	123.798	-0.1	52.017	-0.1	-0.1	-0.1	-0.1
370	-0.1	-0.1	0.175	0.081	-0.1	78.455	-0.1	66.892	-0.1	-0.1	-0.1	0.029
363	-0.1	-0.1	-0.1	0.043	-0.1	90.046	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
364	-0.1	-0.1	-0.1	0.033	-0.1	97.334	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
365	-0.1	-0.1	-0.1	0.047	-0.1	94.67	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
366	-0.1	-0.1	-0.1	0.052	-0.1	96.24	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
367	-0.1	-0.1	-0.1	0.045	-0.1	92.605	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
368	-0.1	**6.227**	4.33	-0.1	37.935	-0.1	**0.07**	45.049	-0.1	0.9	-0.1	-0.1
369	-0.1	**3.589**	12.078	-0.1	53.827	-0.1	**0.153**	220.105	-0.1	1.7	-0.1	-0.1
370	-0.1	**2.91**	1.835	-0.1	41.817	-0.1	**0.035**	55.321	-0.1	3.7	-0.1	-0.1
363	-0.1	**4.035**	0.976	-0.1	9.154	-0.1	-0.1	2.823	-0.1	0.4	-0.1	-0.1
364	-0.1	**6.46**	2.319	-0.1	28.12	-0.1	**0.013**	6.687	-0.1	0.5	-0.1	-0.1
365	-0.1	**6.13**	3.194	-0.1	30.867	0.043	**0.018**	8.798	-0.1	0.6	-0.1	-0.1
366	0.028	**6.13**	2.257	-0.1	24.372	0.03	-0.1	7.47	-0.1	0.6	-0.1	-0.1
367	-0.1	**6.072**	2.979	-0.1	28.333	-0.1	**0.015**	10.896	-0.1	0.7	-0.1	-0.1

Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
368	32.831	-0.1	0.019	0.706	1	7.1	**1**	0	14.4	**871**	7.68
369	**237.781**	-0.1	0.026	**2.065**	**4.2**	10.4	0	0	14.4	**1313**	8.24
370	21.974	-0.1	0.015	-0.1	1.3	7	0	0	14	**951**	7.34
363	18.874	-0.1	-0.1	-0.1	0.1	5.8	**1**	0	7	507	7.73
364	17.865	-0.1	-0.1	-0.1	0.2	7.3	**1**	0	8.8	694	7.33
365	21.467	-0.1	-0.1	-0.1	0.2	7.3	0	0	9.3	707	7.58
366	17.776	-0.1	-0.1	0.63	0.2	7.1	**1**	0	8.2	665	7.60
367	18.752	-0.1	-0.1	-0.1	0.3	7.1	**1**	0	8.4	691	7.58

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #11 Dixie and E & I SCDs



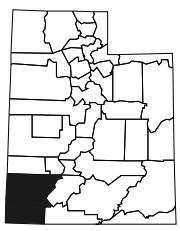
Map Scale 1:100,414
(1 inch = 1.58 miles)

Legend

- *2000 Sample Location*
- *Irrigated Cropland*
- *Water Body*
- *SCD Boundary*
- *Primary Route*
- *Primary Road*
- *Other Road*
- *Perennial Stream*
- *Intermittent Stream*
- *Canal or Ditch*

N

SCD Location



Utah Department of Agriculture and Food GIS January, 2001

Kane County District

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected. Three samples have EC values greater than 750 μmhos/cm. Samples 238, 239, and 240 exceed the 750 standard with values of ranging from 1218 to 2115. No samples exceeded the severe-injury level of 3,000 μmhos/cm, which affects most plants.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. No samples from this district have elevated SAR values.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates, which is common for water in Utah. Samples 239 and 240 exceed the 8.5 level.

Samples 239 and 240 have elevated concentrations of manganese (Mn). Manganese above 0.2 ppm can injure plants and cause reduction in dry matter production. Excess manganese interferes with the ability of plants to use other nutrients such as calcium.

Samples 235, 238, 239, and 240 have elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

No other elements were found in concentrations harmful to plants.

Livestock:

Sulfate (SO4) is shown on chemical analyses for sulfur (S). Sulfur in water would be in the sulfate form so the assumption is made that all detected sulfur is sulfate. Sulfate can cause water to be off flavored and also diarrhea in animals not used to drinking it. Problems start when the sulfur level in water exceeds 167 ppm. Samples 239 and 240 have elevated sulfur.

Culinary:

The water in this area ranges from soft to very hard, with GPG (grains per gallon) ranging from 3.7 to 15.6 with a mean of 9.57. Water temperatures ranged from 12.9 to 21.7 and a mean of 16.5 °C. The pH for the area has a mean of 7.7 and ranges from 7.5 to 7.9.

Salinity for sample sites 238, 239, and 240 exceeds the EPA aesthetic standard of 833 μmhos/cm. At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333.

Samples 239 and 240 have high manganese (Mn) concentrations. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

Samples 238, 239, 240, and 241 also have high sulfur. Sulfate is an anion that can cause flavor problems in drinking water at concentrations greater than 83 ppm of soluble sulfur. Bacteria in the water use sulfur and produce hydrogen sulfide gas (rotten egg gas). The bacteria that produce this compound can live in plumbing fixtures and even hot water heaters. It is not uncommon to get strong odors when the hot water is turned on in areas where there is high sulfate. Generally people cannot tolerate the odor from this gas. Even if the gas is not present high sulfate concentrations can cause diarrhea in people not used to drinking it.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develop only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminates are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 235, 236, and 239 are contaminated with Coliform. No samples were found to be contaminated with E. coli.

Sample Site Test Data for Kane County District

Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
235	-0.1	-0.1	-0.1	0.306	-0.1	52.373	-0.1	4.788	-0.1	-0.1	-0.1	-0.1
236	-0.1	-0.1	-0.1	0.43	-0.1	61.48	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
237	-0.1	-0.1	-0.1	0.046	-0.1	49.492	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
238	-0.1	-0.1	0.145	0.044	-0.1	121.87	-0.1	10.075	-0.1	-0.1	-0.1	-0.1
239	-0.1	-0.1	0.375	0.047	-0.1	84.264	-0.1	74.917	-0.1	-0.1	-0.1	-0.1
240	-0.1	-0.1	0.517	0.035	-0.1	86.212	-0.1	66.352	-0.1	-0.1	-0.1	-0.1
241	-0.1	-0.1	-0.1	0.105	-0.1	67.583	-0.1	15.583	-0.1	-0.1	-0.1	-0.1

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
235	0.021	**5.626**	1.212	-0.1	37.732	-0.1	**0.012**	4.824	-0.1	1	-0.1	-0.1
236	-0.1	**5.568**	0.514	-0.1	31.811	-0.1	-0.1	3.656	-0.1	0.9	-0.1	-0.1
237	0.041	**3.182**	1.195	-0.1	14.287	-0.1	-0.1	5.986	-0.1	4.6	-0.1	-0.1
238	0.048	**6.538**	7.712	-0.1	65.716	-0.1	**0.059**	44.459	-0.1	1.6	-0.1	-0.1
239	0.158	**11.892**	4.172	-0.1	149.738	**0.245**	**0.104**	170.25	-0.1	0.9	-0.1	-0.1
240	-0.1	**9.37**	5.125	-0.1	180.149	**0.21**	**0.083**	173.252	-0.1	0.7	-0.1	-0.1
241	-0.1	**3.376**	4.5	-0.1	134.561	-0.1	-0.1	109.029	-0.1	3.5	-0.1	-0.1

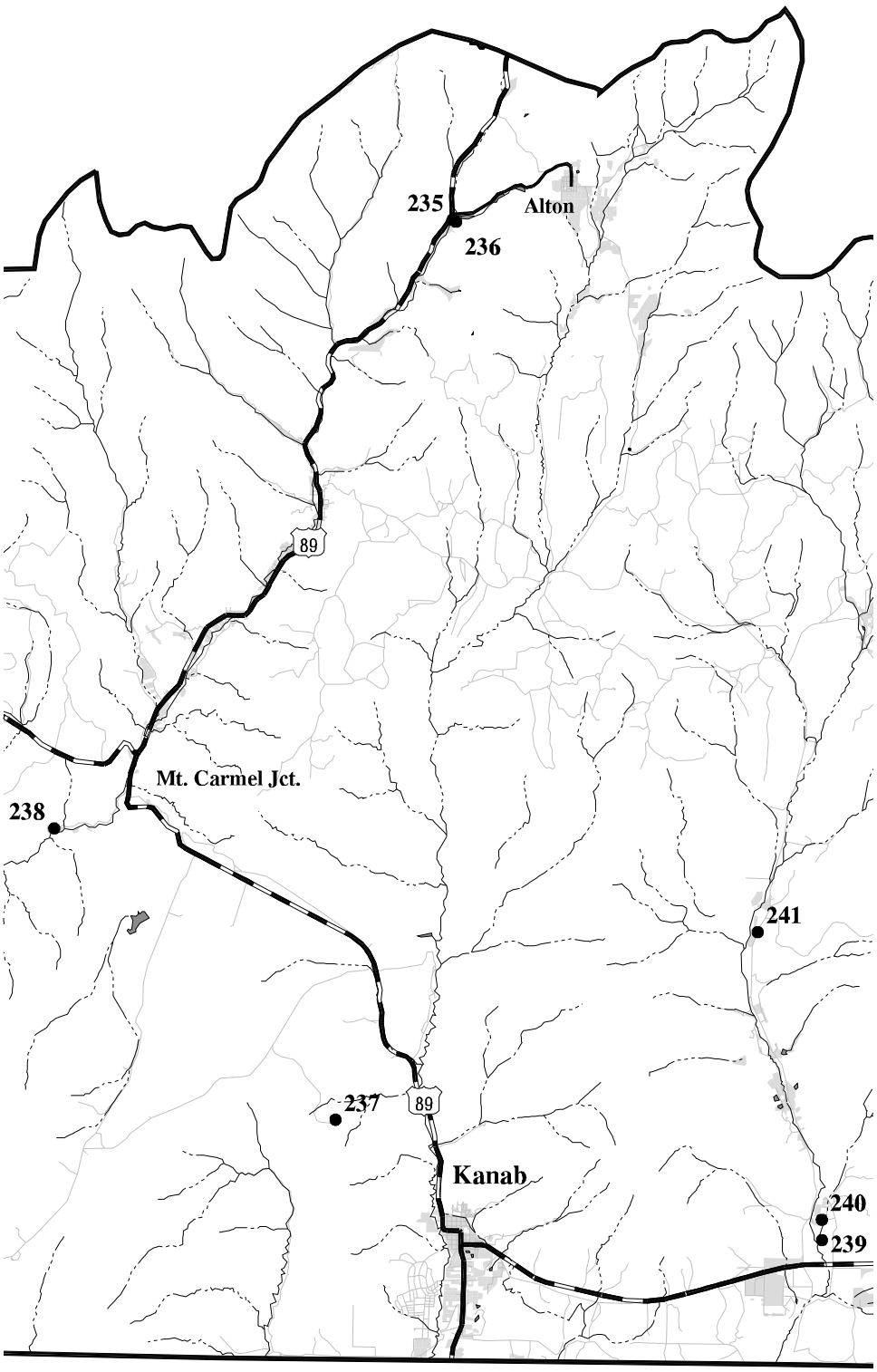
Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
235	1.876	-0.1	-0.1	-0.1	0.1	5.3	**1**	0	12.9	537	7.60
236	2.718	-0.1	-0.1	0.071	0.1	5.5	**1**	0	17.1	527	7.50
237	2.862	-0.1	-0.1	0.08	0.2	3.7	0	0	21.7	378	7.90
238	**111.645**	-0.1	-0.1	0.378	0.8	11	0	0	14.2	**1218**	7.80
239	**195.082**	-0.1	-0.1	-0.1	2.6	13.7	**1**	0	17.2	**2115**	7.60
240	**202.912**	-0.1	-0.1	-0.1	2.4	15.6	0	0	13.9	**1667**	7.70
241	**135.874**	-0.1	-0.1	0.04	1.8	11.8	0	0	18.5	621	7.80

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #12 Kane County SCD

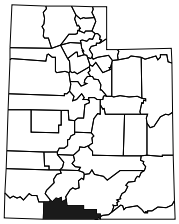
Legend

- *2000 Sample Location*
- *Irrigated Cropland*
- *Water Body*
- *SCD Boundary*
- *Primary Route*
- *Primary Road*
- *Other Road*
- *Perennial Stream*
- *Intermittent Stream*
- *Canal or Ditch*



N

SCD Location



Map Scale 1:283,250
(1 inch = 4.47 miles)

Upper Sevier District

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected. Seven samples have EC values greater than 750 μmhos/cm. Samples 113, 114, 115, 116, 117, 233, and 362 with values of ranging from 757 to 1764. None of the samples exceeded the severe-injury level of 3,000 μmhos/cm, which affects most plants.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. None of the water samples from this district have elevated SAR values.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates (except for number 227 with a value of 1.28), which is common for water in Utah. Sample 233 exceeds the 8.5 level.

Samples 223, 224, and 229 have elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

Sample 88 has elevated zinc (zn) that can cause growth problems in plants when it is greater than 2.0 ppm in water. High concentrations of zinc decrease root growth and leaf expansion as well as inhibit the uptake of iron and phosphorus.

No other elements were found in concentrations harmful to plants.

Livestock:

All of the sample sites meet livestock quality standards.

Culinary:

The water in this area ranges from moderately hard to hard, with GPG (grains per gallon) ranging from 1.1 to 7.4 with a mean of 4.18. Water temperatures ranged from 10 to 26.5 and a mean of 15.02 °C. The pH for the area has a mean of 7.20 and ranges from 6.92 to 9.00.

Salinity for sample sites 113,114, 115, 116, 117, 233, and 362 exceeds the EPA aesthetic standard of 833 μmhos/cm. At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333. None of the samples exceeded the health standard.

Several minerals were found to exceed the aesthetic drinking water quality standard. Samples 86, 87, 93, and 226 have high iron (Fe). This can cause discoloration of plumbing fixtures and promote the growth of iron bacteria, which also stains anything that it contacts. Again, this is an aesthetic issue, not a health concern.

Sample 226 has high manganese (Mn) level at 0.053 ppm, just above the EPA standard. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

Sample 88 has elevated zinc (Zn). EPA has set an aesthetic standard for zinc at 5.0 ppm because it may produce an unpleasant astringent taste in the water.

The most serious problem with drinking water from individual private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develop only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminates are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 91, 95, 102, 103, 106, 108, 117, 223, 225, 229, 230, and 233 are contaminated with Coliform. Samples 103, 117, 233, and 225 are contaminated with E. coli. These wells should be inspected carefully to determine the source of contamination.

Sample Site Test Data for Upper Sevier District

Data from llisted sample numbers continuted on next page

Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
85	-0.1	-0.1	0.074	0.545	-0.1	53.825	-0.1	12.34	-0.1	-0.1	-0.1	-0.1
86	-0.1	-0.1	0.351	0.177	-0.1	22.756	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
87	-0.1	-0.1	-0.1	0.235	-0.1	59.152	-0.1	6.84	-0.1	-0.1	-0.1	-0.1
88	-0.1	-0.1	-0.1	0.126	-0.1	73.656	-0.1	3.78	-0.1	-0.1	-0.1	-0.1
89	-0.1	-0.1	0.116	0.159	-0.1	22.729	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
90	-0.1	-0.1	-0.1	0.03	-0.1	83.307	-0.1	7.61	-0.1	-0.1	-0.1	-0.1
91	-0.1	-0.1	-0.1	0.155	-0.1	71.856	-0.1	10.28	-0.1	-0.1	-0.1	-0.1
92	-0.1	-0.1	-0.1	0.152	-0.1	63.872	-0.1	17.6	-0.1	-0.1	-0.1	-0.1
93	-0.1	-0.1	-0.1	0.518	-0.1	78.266	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
94	-0.1	-0.1	-0.1	0.259	-0.1	41.724	-0.1	9.24	-0.1	-0.1	-0.1	-0.1
95	-0.1	-0.1	-0.1	0.134	-0.1	42.451	-0.1	8.87	-0.1	-0.1	-0.1	-0.1
96	-0.1	-0.1	-0.1	0.159	-0.1	46.383	-0.1	9.53	-0.1	-0.1	-0.1	-0.1
97	-0.1	-0.1	-0.1	0.196	-0.1	35.042	-0.1	6.12	-0.1	-0.1	-0.1	-0.1
98	-0.1	-0.1	-0.1	0.19	-0.1	63.104	-0.1	10.2	-0.1	-0.1	-0.1	-0.1
99	-0.1	-0.1	-0.1	0.209	-0.1	56.126	-0.1	5.41	-0.1	-0.1	-0.1	-0.1
100	-0.1	-0.1	-0.1	-0.1	-0.1	72.404	-0.1	4.55	-0.1	-0.1	-0.1	-0.1
101	-0.1	-0.1	-0.1	-0.1	-0.1	34.183	-0.1	18.82	-0.1	-0.1	-0.1	-0.1
102	-0.1	-0.1	-0.1	0.061	-0.1	67.337	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
103	-0.1	-0.1	-0.1	0.84	-0.1	46.222	-0.1	4.49	-0.1	-0.1	-0.1	-0.1
105	-0.1	-0.1	-0.1	-0.1	-0.1	37.85	-0.1	4.94	-0.1	-0.1	-0.1	-0.1
106	-0.1	-0.1	-0.1	0.062	-0.1	59.129	-0.1	6.48	-0.1	-0.1	-0.1	-0.1
107	-0.1	-0.1	-0.1	-0.1	-0.1	45.069	-0.1	3.85	-0.1	-0.1	-0.1	-0.1
108	-0.1	-0.1	-0.1	-0.1	-0.1	44.251	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
109	-0.1	-0.1	0.093	-0.1	-0.1	44.968	-0.1	5.59	-0.1	-0.1	-0.1	-0.1
110	-0.1	-0.1	-0.1	-0.1	-0.1	44.493	-0.1	4.26	-0.1	-0.1	-0.1	-0.1
111	-0.1	-0.1	-0.1	0.024	-0.1	57.898	-0.1	3.57	-0.1	-0.1	-0.1	-0.1
112	-0.1	-0.1	-0.1	0.108	-0.1	68.822	-0.1	37.86	-0.1	-0.1	-0.1	-0.1
113	-0.1	-0.1	-0.1	-0.1	-0.1	35.987	-0.1	6.57	-0.1	-0.1	-0.1	-0.1
114	0.05	-0.1	-0.1	-0.1	-0.1	46.029	-0.1	4.5	-0.1	-0.1	-0.1	-0.1
115	-0.1	-0.1	-0.1	0.024	-0.1	34.329	-0.1	3.98	-0.1	-0.1	-0.1	0.03
116	-0.1	-0.1	0.072	0.087	-0.1	63.686	-0.1	3.9	-0.1	-0.1	-0.1	0.038
117	-0.1	-0.1	-0.1	0.07	-0.1	32.16	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
223	-0.1	-0.1	-0.1	0.057	-0.1	65.892	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
224	-0.1	-0.1	-0.1	0.023	-0.1	66.836	-0.1	-0.1	-0.1	-0.1	-0.1	0.022
225	0.072	-0.1	-0.1	-0.1	-0.1	23.444	-0.1	-0.1	-0.1	-0.1	-0.1	0.03
226	-0.1	-0.1	0.091	-0.1	-0.1	49.245	-0.1	7.999	-0.1	-0.1	-0.1	-0.1
227	-0.1	-0.1	-0.1	-0.1	-0.1	15.036	-0.1	9.374	-0.1	-0.1	-0.1	-0.1
228	-0.1	-0.1	-0.1	0.177	-0.1	48.464	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
229	-0.1	-0.1	0.125	-0.1	-0.1	37.036	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
230	-0.1	-0.1	-0.1	-0.1	-0.1	38.648	-0.1	3.504	-0.1	-0.1	-0.1	-0.1
231	-0.1	-0.1	-0.1	0.064	-0.1	40.05	-0.1	-0.1	-0.1	-0.1	-0.1	0.02
232	-0.1	-0.1	-0.1	0.387	-0.1	47.599	-0.1	4.38	-0.1	-0.1	-0.1	-0.1
233	-0.1	-0.1	-0.1	0.264	-0.1	49.499	-0.1	3.882	-0.1	-0.1	-0.1	-0.1
234	-0.1	-0.1	-0.1	0.347	-0.1	44.714	-0.1	3.941	-0.1	-0.1	-0.1	0.025
362	-0.1	-0.1	-0.1	-0.1	-0.1	34.035	-0.1	12.353	-0.1	-0.1	-0.1	-0.1

Bolded and shaded values exceed minimum irrigation or livestock standards

Sample Site Test Data for Upper Sevier District

Data from llisted sample numbers continuted on next page

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
85	0.051	**5.063**	3.795	-0.1	28.387	-0.1	-0.1	8.155	-0.1	0.6	-0.1	-0.1
86	**0.767**	**3.744**	8.34	0.114	21.744	**0.197**	-0.1	7.664	-0.1	0.2	-0.1	-0.1
87	**0.429**	**5.645**	2.527	0.066	29.278	-0.1	-0.1	7.422	-0.1	1.9	-0.1	-0.1
88	0.109	**7.644**	2.849	0.128	29.276	**0.081**	-0.1	7.942	-0.1	0.5	-0.1	-0.1
89	0.122	**3.919**	5.435	0.066	20.766	-0.1	-0.1	4.366	-0.1	0.9	-0.1	-0.1
90	0.054	**6.887**	2.424	0.051	21.879	-0.1	-0.1	9.804	-0.1	1.6	0.151	-0.1
91	0.042	**6.965**	1.755	-0.1	54.415	-0.1	-0.1	8.322	-0.1	1	-0.1	-0.1
92	0.102	**4.908**	2.984	-0.1	20.113	-0.1	-0.1	10.052	-0.1	0.9	-0.1	-0.1
93	**0.382**	**6.906**	2.729	-0.1	24.059	-0.1	-0.1	14.004	-0.1	0.2	-0.1	-0.1
94	0.1	**4.365**	0.977	-0.1	31.238	-0.1	-0.1	9.193	-0.1	0.7	-0.1	-0.1
95	0.096	**4.792**	1.857	-0.1	37.483	-0.1	-0.1	9.398	-0.1	0.9	-0.1	-0.1
96	0.055	**5.102**	1.015	-0.1	39.959	-0.1	-0.1	10.769	-0.1	1.4	-0.1	-0.1
97	0.073	**4.443**	1.48	-0.1	35.216	-0.1	-0.1	8.053	-0.1	0.6	-0.1	-0.1
98	0.062	**6.674**	0.676	-0.1	50.232	-0.1	-0.1	11.018	-0.1	1	-0.1	-0.1
99	0.31	**7.003**	1.887	-0.1	51.86	-0.1	-0.1	4.686	-0.1	1	-0.1	-0.1
100	0.046	**5.801**	3.579	-0.1	16.175	-0.1	-0.1	13.576	-0.1	0.9	0.137	-0.1
101	0.035	**2.891**	6.823	-0.1	11.923	-0.1	-0.1	15.487	-0.1	1.4	-0.1	-0.1
102	0.04	**8.051**	3.677	-0.1	29.021	-0.1	-0.1	22.57	-0.1	0.6	-0.1	-0.1
103	0.095	**4.229**	2.977	-0.1	19.09	-0.1	-0.1	18.851	-0.1	1.2	-0.1	-0.1
105	0.037	**4.326**	4.405	-0.1	9.676	-0.1	-0.1	22.362	-0.1	1.3	-0.1	-0.1
106	0.124	**4.889**	2.442	-0.1	23.621	-0.1	-0.1	20.438	-0.1	1	-0.1	-0.1
107	0.031	**4.21**	4.011	-0.1	11.546	-0.1	-0.1	15.017	-0.1	0.9	-0.1	-0.1
108	0.284	**5.316**	3.801	-0.1	11.203	-0.1	-0.1	16.516	-0.1	0.3	-0.1	-0.1
109	0.08	**3.977**	3.866	-0.1	11.574	-0.1	-0.1	17.837	-0.1	1.2	-0.1	-0.1
110	0.199	**4.093**	3.801	-0.1	11.221	-0.1	-0.1	15.685	-0.1	1.4	-0.1	-0.1
111	0.059	**5.548**	3.926	-0.1	23.083	-0.1	-0.1	6.846	-0.1	1.7	-0.1	-0.1
112	0.089	**4.714**	2.686	-0.1	27.836	-0.1	-0.1	6.728	-0.1	1.3	-0.1	-0.1
113	-0.1	**3.104**	3.473	-0.1	9.297	-0.1	-0.1	11.707	-0.1	1.8	-0.1	-0.1
114	0.065	**2.503**	1.333	-0.1	12.533	-0.1	-0.1	21.304	-0.1	1.7	-0.1	-0.1
115	0.098	**8.09**	2.473	-0.1	6.978	-0.1	-0.1	6.143	-0.1	1.1	-0.1	-0.1
116	0.033	**7.605**	2.187	-0.1	42.987	-0.1	-0.1	33.157	-0.1	0.9	-0.1	-0.1
117	0.146	**2.813**	2.717	-0.1	11.684	-0.1	-0.1	7.542	-0.1	2.1	0.52	-0.1
223	-0.1	**6.014**	2.857	-0.1	27.974	-0.1	**0.015**	21.397	-0.1	1	-0.1	-0.1
224	0.026	**6.693**	3.104	-0.1	28.921	-0.1	**0.02**	40.524	-0.1	2.6	-0.1	-0.1
225	0.122	**1.765**	3.07	-0.1	6.785	0.033	-0.1	6.683	-0.1	1	-0.1	-0.1
226	**0.486**	**3.783**	2.9	-0.1	13.561	**0.053**	-0.1	23.642	-0.1	3.2	-0.1	-0.1
227	0.063	1.28	1.175	-0.1	3.661	0.025	-0.1	21.434	-0.1	1.2	-0.1	-0.1
228	-0.1	**3.919**	3.199	-0.1	20.375	-0.1	-0.1	6.234	-0.1	1.2	-0.1	-0.1
229	0.024	**6.984**	6.483	-0.1	12.214	-0.1	**0.053**	15.89	-0.1	1	-0.1	-0.1
230	0.037	**3.259**	3.195	-0.1	11.075	-0.1	-0.1	19.119	-0.1	1	-0.1	-0.1
231	0.044	**2.619**	1.565	-0.1	12.686	0.026	-0.1	6.525	-0.1	1	-0.1	-0.1
232	0.03	**4.443**	2.628	-0.1	30.92	0.021	-0.1	9.634	-0.1	1.4	-0.1	-0.1
233	0.034	**8.943**	1.223	-0.1	29.987	-0.1	-0.1	5.426	-0.1	0.9	-0.1	-0.1
234	0.044	**3.492**	1.274	-0.1	19.339	-0.1	-0.1	7.143	-0.1	1.4	-0.1	-0.1
362	0.123	**2.367**	4.421	-0.1	8.731	-0.1	-0.1	14.567	-0.1	0.5	-0.1	-0.1

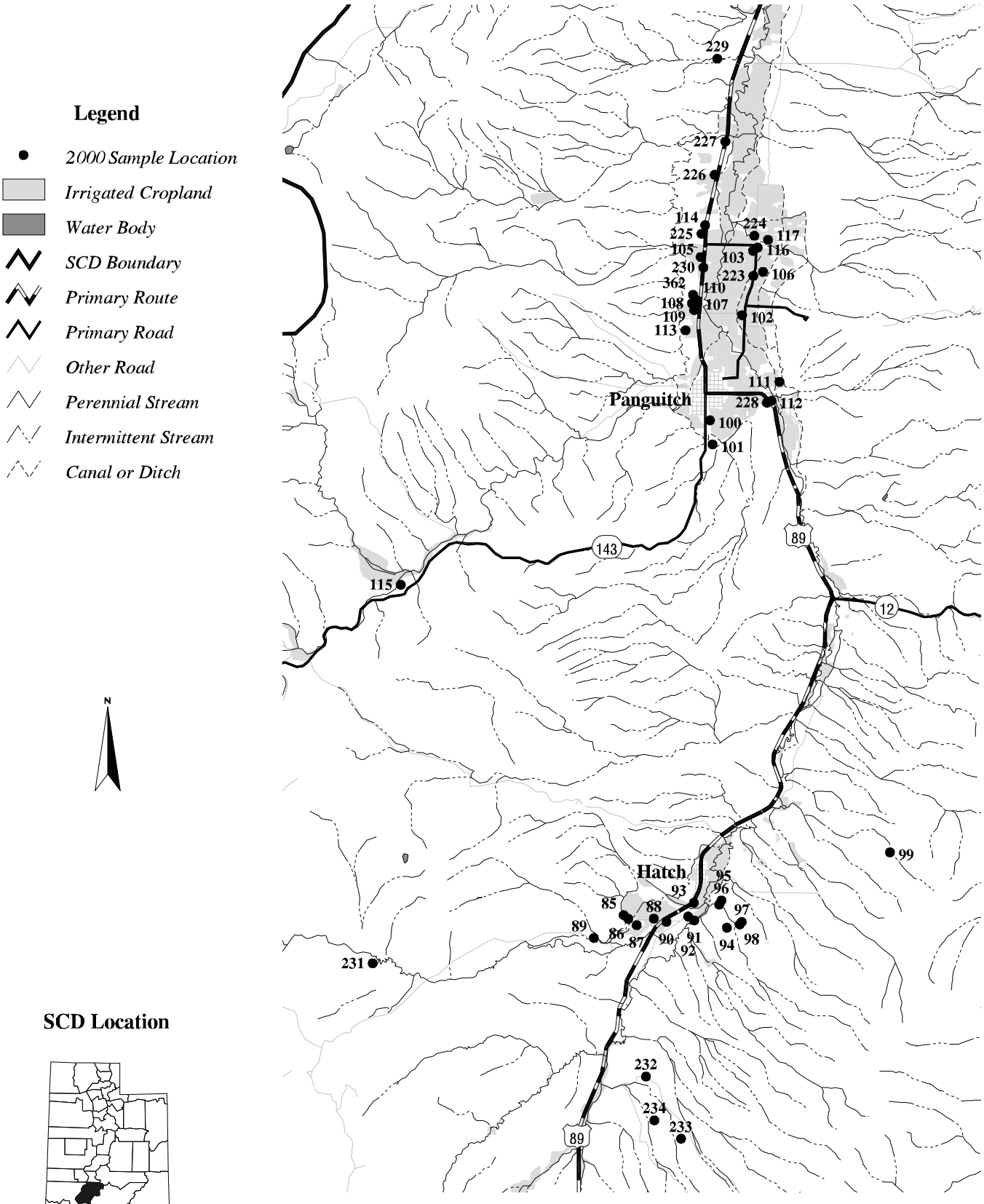
Bolded and shaded values exceed minimum irrigation or livestock standards

Sample Site Test Data for Upper Sevier District

Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
85	2.454	-0.1	-0.1	0.271	0.2	4.8	0	0	15.5	475	7.37
86	2.829	-0.1	-0.1	-0.1	0.3	2.6	0	0	19.7	296	7.00
87	1.945	-0.1	-0.1	0.053	0.2	5.2	0	0	15.2	509	7.00
88	1.36	-0.1	-0.1	**7.27**	0.2	6	0	0	19.8	552	7.00
89	4.088	-0.1	-0.1	0.092	0.2	2.5	0	0	14.8	293	7.00
90	1.686	-0.1	-0.1	0.118	0.2	6.2	0	0	15.4	512	7.00
91	22.079	-0.1	-0.1	0.208	0.2	7.4	**1**	0	17.8	715	7.00
92	1.821	-0.1	-0.1	0.188	0.3	4.9	0	0	19.8	488	7.00
93	1.531	-0.1	-0.1	0.205	0.4	6	0	0	12.2	574	7.00
94	8.059	-0.1	-0.1	0.104	0.3	4.3	0	0	11.3	459	7.00
95	11.385	-0.1	-0.1	-0.1	0.3	4.7	**1**	0	15	458	7.00
96	9.936	-0.1	-0.1	-0.1	0.3	5	0	0	12.2	541	7.00
97	7.768	-0.1	-0.1	0.096	0.2	4.1	0	0	14.4	421	7.00
98	12.515	-0.1	-0.1	-0.1	0.3	6.6	0	0	11.4	676	7.00
99	5.652	-0.1	-0.1	0.057	0.1	6.3	0	0	10	630	7.00
100	1.858	-0.1	-0.1	0.065	0.4	5.2	0	0	12.4	512	7.87
101	4.573	-0.1	-0.1	0.24	0.6	2.7	0	0	15.2	349	7.97
102	2.503	-0.1	-0.1	0.106	0.6	5.6	**1**	0	13.7	594	7.66
103	2.793	-0.1	-0.1	0.088	0.6	3.8	**1**	**1**	10.9	428	7.00
105	2.027	-0.1	0.011	-0.1	0.8	2.8	0	0	16.6	339	7.00
106	3.571	-0.1	-0.1	0.067	0.6	4.8	**1**	0	12.1	521	7.00
107	1.382	-0.1	-0.1	-0.1	0.5	3.3	0	0	15.6	361	7.00
108	1.147	-0.1	-0.1	0.543	0.6	3.2	**1**	0	18.8	363	7.00
109	2.326	-0.1	-0.1	-0.1	0.6	3.3	0	0	13	374	7.00
110	1.423	-0.1	0.01	-0.1	0.5	3.3	0	0	15.6	356	7.00
111	1.793	-0.1	-0.1	-0.1	0.2	4.7	0	0	15.1	463	7.00
112	3.914	-0.1	-0.1	0.155	0.2	5.7	0	0	14	561	7.00
113	2.743	-0.1	-0.1	-0.1	0.4	2.6	0	0	15.9	**1340**	7.00
114	1.508	-0.1	-0.1	0.113	0.7	3.4	0	0	16.4	**1764**	7.00
115	0.944	-0.1	-0.1	-0.1	0.2	2.4	0	0	15.1	**1002**	7.00
116	3.279	-0.1	0.019	0.078	0.8	6.2	0	0	15.2	**1352**	7.00
117	1.708	-0.1	-0.1	-0.1	0.3	2.6	**1**	**1**	15.4	**1147**	7.00
223	3.776	-0.1	-0.1	0.156	0.6	5.5	**1**	0	12.8	594	7.30
224	4.055	-0.1	0.018	0.163	1	5.6	0	0	14.7	689	7.30
225	1.742	-0.1	-0.1	-0.1	0.3	1.8	**1**	**1**	16.5	189	9.00
226	5.386	-0.1	-0.1	-0.1	0.8	3.7	0	0	18.8	413	7.70
227	3.387	-0.1	-0.1	-0.1	1.3	1.1	0	0	16.2	170	7.60
228	3.534	-0.1	-0.1	0.1	0.2	4	0	0	14.1	403	7.00
229	6.105	-0.1	0.01	-0.1	0.6	2.9	**1**	0	26.5	355	7.10
230	2.438	-0.1	0.016	0.127	0.7	2.9	**1**	0	16.2	352	7.10
231	4.828	-0.1	-0.1	0.048	0.2	3.1	0	0	11	270	7.30
232	6.158	-0.1	-0.1	0.116	0.3	4.6	0	0	12	457	7.30
233	5.011	-0.1	-0.1	-0.1	0.2	4.6	**1**	**1**	14.2	**955**	8.10
234	4.709	-0.1	-0.1	0.232	0.2	3.7	0	0	14.5	359	7.50
362	3.401	-0.1	-0.1	0.061	0.6	2.5	0	0	13	**757**	6.92

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #13 Upper Sevier SCD



Map Scale 1:219,370
(1 inch = 3.5 miles)

Zone 7

One hundred thirty-nine sites were sampled in the two districts of Zone 7 during the spring, summer and fall of 2000. These include 74 sites sampled in the Grand District and 65 sampled in the San Juan District. Four separate narrative reports are presented. These include the Castle Valley and Spanish Valley areas for the Grand District, and the La Sal and Monticello / Blanding areas for the San Juan District. Each report includes data tables and maps showing approximate locations of sample sites. Each report covers three categories of water quality criteria—irrigation, livestock, and culinary. Since water use may overlap among these categories for a single well, analytical results are compared to all three sets of criteria.

Grand District (Castle Valley Area)

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (µmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 µmhos/cm salt-sensitive plants begin to be affected. Twenty-three samples have EC values greater than 750 µmhos/cm. These wells are found on the west, east, and north edge of the valley. The lowest EC values are found in the valley center and far south end of the valley. Sample 294 exceeded the severe-injury level of 3,000 µmhos/cm, which affects most plants with a value of 6,080 µmhos/cm.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. Samples 281 and 294 have elevated SAR values of 6.6 and 8.1, respectively.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates, which is common for water in Utah.

Some specific elements can be toxic to plants. Sample 294 has elevated boron (B) which is toxic to sensitive plants when it exceeds 0.7 ppm. It will cause severe injury at 10.0 ppm. However, boron in trace amounts is required for proper plant growth. It is important to monitor this element because the margin separating safe health from toxicity is so close.

Chlorine, found in the form of chloride (Cl^-), can damage sensitive plants at concentrations above 145 ppm and concentrations exceeding 355 ppm can cause severe damage to almost all plants. Samples 271, 272, 280, and 296 have elevated chlorine ranging between 152.37 and 189.48 ppm, respectively. Using this water in sprinkler irrigation, especially in windy conditions, increases the problem.

Twenty-one samples--269 through 276, 278 through 281, 283, 285, 286, 294, and 296 through 300--have elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal

concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

No other elements were found in concentrations harmful to plants.

Livestock:

Samples 271 through 276, 278 through 280, 285, 286, 294, 296, 298, and 299 have sulfur (S) levels, which exceed the livestock standard for sulfur. Sulfate can cause water to be off flavored and can cause diarrhea in animals not used to drinking it. Problems start when the sulfur level in water exceeds 167 ppm.

Culinary:

The water in this area ranges from soft to very hard, with GPG (grains per gallon) ranging from 1.6 to 42.0 with a mean of 11.24. Water temperatures ranged from 7.5 to 27.9 and a mean of 17.24 °C. The pH for the area has a mean of 7.80 and ranges from 7.36 to 9.33.

Salinity for 23 sample sites, 256, 261, 262, 268 through 276, 278 through 281, 283, 285, 286, 294, and 296 through 300 exceed the EPA aesthetic standard of 833 μmhos/cm. At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333. Sample 294 exceeds this health standard with a EC value of 6,080.

Several minerals were found to exceed the aesthetic drinking water quality standard. Samples 285, 294, and 296 have high iron (Fe). This can cause discoloration of plumbing fixtures and promote the growth of iron bacteria, which also stains anything that it contacts. Again, this is an aesthetic issue, not a health concern.

Sample 294 has a high manganese (Mn) level. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

Samples 256, 261, 262, 268 through 276, 278, 279, 280, 283, 285, 286, 294, 296, 298, 299 and 300 have high sulfur (S) with concentrations in the excess of 83 ppm. Sulfate is an anion that can cause flavor problems in drinking water at concentrations greater than 83 ppm of soluble sulfur. Bacteria in the water uses sulfur and produce hydrogen sulfide gas (rotten egg gas). The bacteria that produce this compound can live in plumbing fixtures and even hot water heaters. It is not uncommon to get strong odors when the hot water is turned on in areas where there is high sulfate. Generally people cannot tolerate the odor from this gas. Even if the gas is not present, high sulfate concentrations can cause diarrhea in people not used to drinking it.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develop only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contamination is entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 259, 260 through 262, 265, 269, 270, 274, 276 through 279, 281, 286, 298, 299, 301, and 341 are contaminated with Coliform. Samples 299 and 341 are contaminated with E. coli. These wells should be inspected carefully to determine the source of contamination.

Sample Site Test Data for Grand District (Castle Valley Area)

Data from listed sample numbers continued on next page

Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu	Fe	HCO3	K	Li	Mg	Mn
255	-0.1	-0.1	-0.1	0.04	-0.1	49.39	-0.1	4.967	-0.1	0	-0.1	-0.1	-0.1	**2.425**	1.695	-0.1	15.46	-0.1
256	-0.1	-0.1	-0.1	-0.1	-0.1	118.467	-0.1	39.228	-0.1	0	-0.1	-0.1	-0.1	**2.289**	2.613	-0.1	31.589	-0.1
257	-0.1	-0.1	-0.1	0.026	-0.1	77.122	-0.1	19.316	-0.1	0	-0.1	-0.1	-0.1	**2.541**	2.027	-0.1	22.501	-0.1
258	-0.1	-0.1	-0.1	-0.1	-0.1	87.908	-0.1	29.898	-0.1	0	-0.1	-0.1	0.146	**2.367**	2.155	-0.1	24.574	-0.1
259	-0.1	-0.1	-0.1	0.031	-0.1	57.077	-0.1	20.579	-0.1	0	-0.1	-0.1	-0.1	**2.891**	1.866	-0.1	17.444	-0.1
260	-0.1	-0.1	-0.1	0.021	-0.1	83.635	-0.1	28.225	-0.1	0	-0.1	-0.1	0.049	**2.658**	2.037	-0.1	23.314	-0.1
261	-0.1	-0.1	-0.1	-0.1	-0.1	115.31	-0.1	40.398	-0.1	0	-0.1	-0.1	0.089	**2.464**	2.349	-0.1	30.622	0.034
262	-0.1	-0.1	-0.1	0.023	-0.1	111.638	-0.1	66.671	-0.1	0	-0.1	-0.1	0.045	**3.259**	3.055	-0.1	30.398	-0.1
263	-0.1	-0.1	-0.1	0.047	-0.1	52.685	-0.1	13.13	-0.1	0	-0.1	-0.1	-0.1	**2.91**	1.623	-0.1	16.071	-0.1
264	-0.1	-0.1	-0.1	0.051	-0.1	43.083	-0.1	15.262	-0.1	0	-0.1	-0.1	-0.1	**2.755**	1.524	-0.1	13.188	-0.1
265	-0.1	-0.1	-0.1	0.174	-0.1	44.475	-0.1	14.947	-0.1	0	-0.1	-0.1	0.132	**2.425**	1.542	-0.1	13.574	-0.1
266	-0.1	-0.1	-0.1	0.042	-0.1	47.166	-0.1	15.624	-0.1	0	-0.1	-0.1	0.025	**2.541**	1.691	-0.1	15.148	-0.1
267	-0.1	-0.1	-0.1	0.049	-0.1	40.558	-0.1	17.255	-0.1	0	-0.1	-0.1	0.051	**2.289**	1.448	-0.1	12.681	-0.1
268	-0.1	-0.1	-0.1	0.02	-0.1	118.162	-0.1	61.982	-0.1	0	-0.1	-0.1	0.102	**3.123**	3.14	-0.1	34.487	-0.1
269	-0.1	-0.1	-0.1	0.02	-0.1	156.296	-0.1	56.355	-0.1	0	-0.1	-0.1	0.074	**4.598**	3.056	-0.1	43.98	-0.1
270	-0.1	-0.1	-0.1	-0.1	-0.1	149.99	-0.1	44.431	-0.1	0	-0.1	-0.1	0.062	**4.966**	3.104	-0.1	43.182	-0.1
271	-0.1	-0.1	0.282	-0.1	-0.1	193.298	-0.1	**159.823**	-0.1	0	-0.1	-0.1	0.028	**3.764**	12.433	-0.1	73.097	-0.1
272	-0.1	-0.1	0.281	-0.1	-0.1	396.064	-0.1	**160.641**	-0.1	0	-0.1	-0.1	0.159	**2.173**	9.509	-0.1	132.593	-0.1
273	-0.1	-0.1	0.128	-0.1	-0.1	244.82	-0.1	81.434	-0.1	0	-0.1	-0.1	0.063	**2.425**	3.654	-0.1	52.247	-0.1
274	-0.1	-0.1	0.11	-0.1	-0.1	248.581	-0.1	81.086	-0.1	0	-0.1	-0.1	0.095	**2.367**	3.569	-0.1	51.117	-0.1
275	-0.1	-0.1	0.204	-0.1	-0.1	400.403	-0.1	120.249	-0.1	0	-0.1	-0.1	-0.1	**2.425**	5.303	-0.1	84.063	-0.1
276	-0.1	-0.1	0.196	-0.1	-0.1	397.348	-0.1	112.678	-0.1	0	-0.1	-0.1	0.06	**2.464**	5.12	-0.1	76.844	-0.1
277	-0.1	-0.1	-0.1	0.037	-0.1	48.039	-0.1	19.489	-0.1	0	-0.1	-0.1	0.021	**2.425**	1.675	-0.1	15.078	-0.1
278	-0.1	-0.1	0.104	-0.1	-0.1	239.145	-0.1	74.888	-0.1	0	-0.1	-0.1	0.145	**2.444**	3.443	-0.1	51.069	-0.1
279	-0.1	-0.1	0.085	0.02	-0.1	282.123	-0.1	118.237	-0.1	0	-0.1	-0.1	0.023	**4.423**	4.552	-0.1	61.349	-0.1
280	-0.1	-0.1	0.16	-0.1	-0.1	331.619	-0.1	**152.367**	-0.1	0	-0.1	-0.1	0.032	**3.085**	9.185	-0.1	116.506	-0.1
281	-0.1	-0.1	-0.1	-0.1	-0.1	10.217	-0.1	139.31	-0.1	0	-0.1	-0.1	0.12	**2.561**	14.174	-0.1	17.88	0.023
282	-0.1	-0.1	-0.1	0.029	-0.1	59.519	-0.1	21.32	-0.1	0	-0.1	-0.1	-0.1	**2.541**	1.735	-0.1	17.903	-0.1
283	-0.1	-0.1	-0.1	0.025	-0.1	100.747	-0.1	81.708	-0.1	0	-0.1	-0.1	-0.1	**3.007**	3.123	-0.1	32.041	-0.1
284	-0.1	-0.1	-0.1	0.028	-0.1	63.129	-0.1	21.674	-0.1	0	-0.1	-0.1	-0.1	**2.541**	1.862	-0.1	19.826	-0.1
285	-0.1	-0.1	0.205	-0.1	-0.1	411.56	-0.1	132.954	-0.1	0	-0.1	-0.1	**0.338**	**2.6**	5.063	-0.1	66.653	0.026
286	-0.1	-0.1	0.176	-0.1	-0.1	344.933	-0.1	98.164	-0.1	0	-0.1	-0.1	0.033	**2.541**	4.491	-0.1	59.164	-0.1
287	-0.1	-0.1	-0.1	0.032	-0.1	64.559	-0.1	25.354	-0.1	0	-0.1	-0.1	-0.1	**2.483**	2.066	-0.1	24.205	-0.1
288	-0.1	-0.1	-0.1	0.047	-0.1	40.58	-0.1	18.897	-0.1	0	-0.1	-0.1	-0.1	**2.367**	1.59	-0.1	12.601	-0.1
289	-0.1	-0.1	-0.1	0.032	-0.1	52.704	-0.1	40.095	-0.1	0	-0.1	-0.1	0.049	**2.367**	2.191	-0.1	15.893	-0.1
290	-0.1	-0.1	-0.1	0.047	-0.1	42.327	-0.1	16.421	-0.1	0	-0.1	-0.1	0.021	**2.444**	1.78	-0.1	13.226	-0.1
291	-0.1	-0.1	-0.1	0.098	-0.1	40.277	-0.1	18.84	-0.1	0	-0.1	-0.1	0.078	**2.173**	1.669	-0.1	12.855	-0.1
292	-0.1	-0.1	-0.1	0.034	-0.1	51.123	-0.1	39.184	-0.1	0	-0.1	-0.1	0.022	**2.386**	1.973	-0.1	16.003	-0.1
293	-0.1	-0.1	-0.1	0.051	-0.1	44.27	-0.1	14.47	-0.1	0	-0.1	-0.1	0.035	**2.503**	1.814	-0.1	13.578	-0.1
294	-0.1	-0.1	**0.876**	-0.1	-0.1	577.062	-0.1	0	-0.1	0	-0.1	-0.1	**0.397**	**3.861**	34.119	-0.1	141.733	**0.116**
295	-0.1	-0.1	-0.1	0.041	-0.1	42.002	-0.1	31.172	-0.1	0	-0.1	-0.1	-0.1	**2.25**	1.786	-0.1	12.726	-0.1
296	-0.1	-0.1	0.2	-0.1	-0.1	373.329	-0.1	**189.48**	-0.1	0	-0.1	-0.1	**0.305**	**4.443**	6.529	-0.1	120.981	0.044
297	-0.1	-0.1	0.089	0.037	-0.1	94.223	-0.1	72.067	-0.1	0	-0.1	-0.1	-0.1	**3.647**	4.998	-0.1	30.679	-0.1
298	-0.1	-0.1	0.098	-0.1	-0.1	291.961	-0.1	87.698	-0.1	0	-0.1	-0.1	0.092	**4.035**	2.399	-0.1	44.024	-0.1
299	-0.1	-0.1	0.106	-0.1	-0.1	254.611	-0.1	77.687	-0.1	0	-0.1	-0.1	-0.1	**3.434**	2.285	-0.1	44.495	-0.1
300	-0.1	-0.1	0.127	0.051	-0.1	114.261	-0.1	61.135	-0.1	0	-0.1	-0.1	-0.1	**3.24**	2.406	-0.1	39.176	-0.1
301	-0.1	-0.1	-0.1	0.039	-0.1	54.91	-0.1	33.131	-0.1	0	-0.1	0.025	0.066	**2.561**	1.8	-0.1	15.165	-0.1
341	-0.1	-0.1	-0.1	0.035	-0.1	70.779	-0.1	28.689	-0.1	-1	-0.1	0.034	0.086	**3.279**	1.976	-0.1	21.244	-0.1

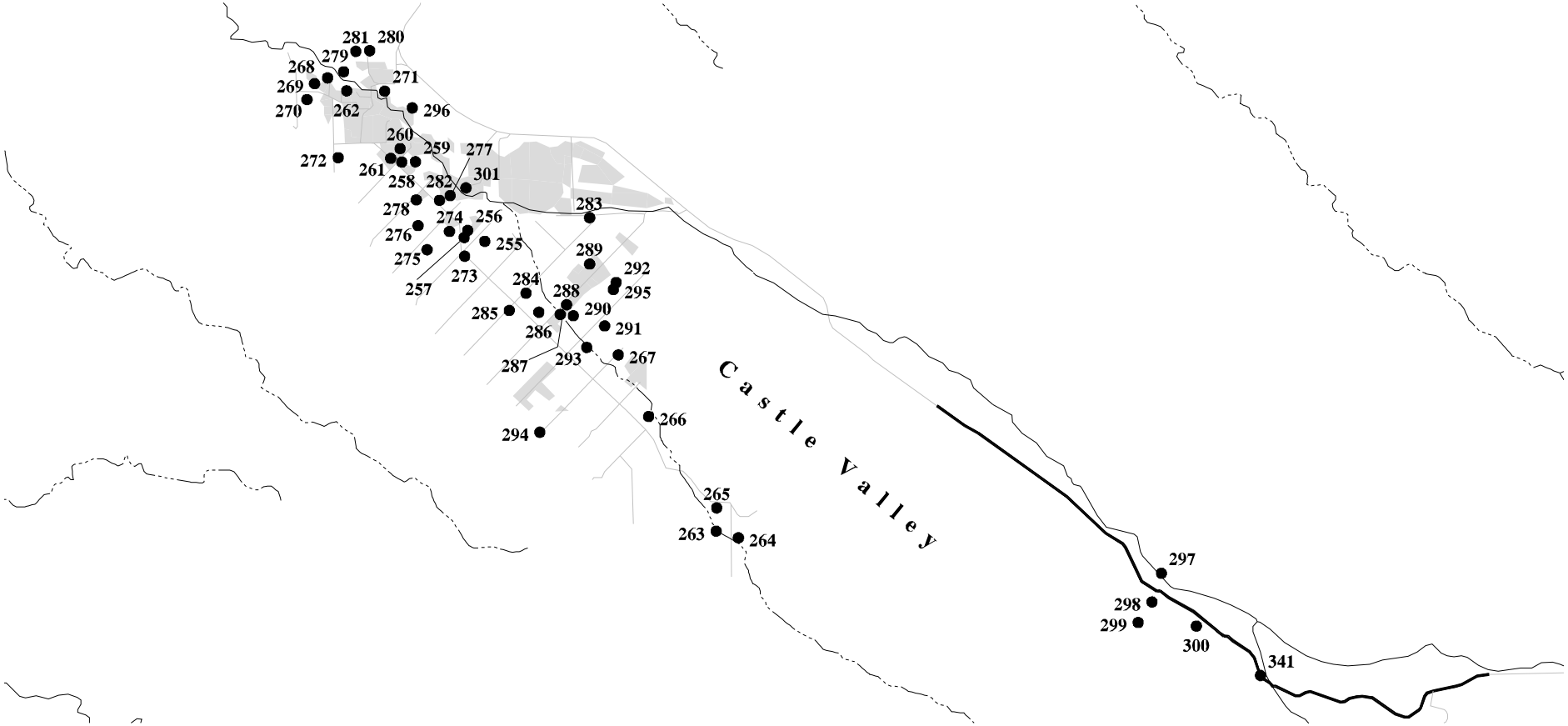
Bolded and shaded values exceed minimum irrigation or livestock standards

Sample Site Test Data for Grand District (Castle Valley Area)

Sample	Mo	Na	Ni	NO3-n	P	Pb	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
255	-0.1	18.55	-0.1	1	-0.1	-0.1	23.889	-0.1	-0.1	-0.1	0.6	3.8	0	0	14.2	455	8.04
256	-0.1	34.121	-0.1	0.9	-0.1	-0.1	**103.002**	-0.1	-0.1	0.045	0.7	8.8	0	0	18.3	**942**	7.45
257	-0.1	24.605	-0.1	1.2	-0.1	-0.1	54.664	-0.1	-0.1	-0.1	0.6	5.8	0	0	16.2	652	7.56
258	-0.1	27.643	-0.1	0.7	-0.1	-0.1	68.259	-0.1	-0.1	0.095	0.7	6.6	**1**	0	19.3	737	7.67
259	-0.1	20.721	-0.1	0.9	-0.1	-0.1	31.96	-0.1	-0.1	-0.1	0.6	4.4	0	0	16	508	7.73
260	-0.1	26.4	-0.1	2.3	-0.1	-0.1	61.773	-0.1	-0.1	0.079	0.7	6.3	**1**	0	16.3	696	7.68
261	-0.1	34.345	-0.1	0	-0.1	-0.1	**99.357**	-0.1	-0.1	-0.1	0.7	8.5	**1**	0	16.6	**929**	7.74
262	-0.1	52.136	-0.1	0.9	-0.1	-0.1	**85.119**	-0.1	-0.1	-0.1	1.1	8.3	**1**	0	16.5	**993**	7.62
263	-0.1	14.969	-0.1	1.3	-0.1	-0.1	20.857	-0.1	-0.1	-0.1	0.5	4	0	0	14.8	447	7.95
264	-0.1	15.371	-0.1	1	-0.1	-0.1	14.459	-0.1	-0.1	-0.1	0.5	3.3	0	0	14	388	8.02
265	-0.1	17.207	-0.1	0.7	-0.1	-0.1	16.023	-0.1	-0.1	-0.1	0.6	3.4	**1**	0	14.6	377	8.09
266	-0.1	18.348	-0.1	1	-0.1	-0.1	21.173	-0.1	-0.1	0.088	0.6	3.6	0	0	21.2	418	8.01
267	-0.1	17.972	-0.1	0.9	-0.1	-0.1	14.662	-0.1	-0.1	0.088	0.6	3.1	0	0	18.5	387	8.16
268	-0.1	49.998	-0.1	0.7	-0.1	-0.1	**98.511**	-0.1	-0.1	0.043	1	8.9	0	0	15.9	**1011**	7.92
269	**0.012**	45.221	-0.1	1	-0.1	-0.1	**113.377**	-0.1	-0.1	0.059	0.8	11.7	**1**	0	16.4	**1176**	7.47
270	**0.014**	41.359	-0.1	1.1	-0.1	-0.1	**98.529**	-0.1	-0.1	-0.1	0.8	11.3	**1**	0	17.1	**1105**	7.39
271	**0.028**	135.462	-0.1	0.6	-0.1	-0.1	**208.289**	-0.1	-0.1	0.063	2.1	15.6	0	0	17.5	**1956**	7.72
272	**0.042**	136.29	-0.1	0.8	-0.1	-0.1	**448.636**	-0.1	-0.1	0.15	1.5	30.9	0	0	21	**2800**	7.83
273	**0.016**	58.093	-0.1	0.9	-0.1	-0.1	**223.654**	-0.1	-0.1	-0.1	0.9	17.4	0	0	16.2	**1654**	7.86
274	**0.015**	57.165	-0.1	0.9	-0.1	-0.1	**222.449**	-0.1	-0.1	-0.1	0.9	17.5	**1**	0	15.8	**1637**	7.75
275	**0.025**	86.115	-0.1	0.9	-0.1	-0.1	**372.077**	-0.1	-0.1	-0.1	1	28.3	0	0	7.5	**2370**	7.50
276	**0.024**	83.307	-0.1	1.1	-0.1	-0.1	**356.641**	-0.1	-0.1	-0.1	1	27.7	**1**	0	16.4	**2300**	7.44
277	-0.1	19.812	-0.1	1.3	-0.1	-0.1	23.678	-0.1	-0.1	0.056	0.6	3.7	**1**	0	16.4	450	8.08
278	**0.015**	54.782	-0.1	0.6	-0.1	-0.1	**210.698**	-0.1	-0.1	0.06	0.8	17	**1**	0	18.7	**1549**	7.72
279	**0.019**	99.878	-0.1	0.6	-0.1	-0.1	**230.993**	-0.1	-0.1	0.069	1.4	20.1	**1**	0	16.6	**1906**	7.39
280	**0.03**	155.867	-0.1	0.9	-0.1	-0.1	**343.196**	-0.1	-0.1	-0.1	1.9	26.2	0	0	17.9	**2400**	7.43
281	**0.019**	151.256	-0.1	1.6	-0.1	-0.1	35.99	-0.1	-0.1	-0.1	**6.6**	1.6	**1**	0	20.4	**898**	9.33
282	-0.1	20.796	-0.1	1.3	-0.1	-0.1	37.914	-0.1	-0.1	-0.1	0.6	4.5	0	0	19.6	539	8.00
283	**0.011**	66.459	-0.1	1.4	-0.1	-0.1	**95.923**	-0.1	-0.1	-0.1	1.5	7.8	0	0	20.7	**1038**	7.70
284	-0.1	21.364	-0.1	0.9	-0.1	-0.1	46.082	-0.1	-0.1	-0.1	0.6	4.9	0	0	17.1	559	8.02
285	**0.029**	84.335	-0.1	1.1	-0.1	-0.1	**382.998**	-0.1	-0.1	0.248	1	28	0	0	22.1	**2300**	7.42
286	**0.024**	69.467	-0.1	0.8	-0.1	-0.1	**324.197**	-0.1	-0.1	0.064	0.9	23.6	**1**	0	21.6	**1997**	7.45
287	-0.1	23.07	-0.1	1.3	-0.1	-0.1	57.07	-0.1	-0.1	-0.1	0.6	5.2	0	0	16.1	620	7.92
288	-0.1	17.851	-0.1	1.1	-0.1	-0.1	17.802	-0.1	-0.1	-0.1	0.6	3.1	0	0	14.7	394	8.02
289	-0.1	35.536	-0.1	0.9	-0.1	-0.1	31.824	-0.1	-0.1	-0.1	1.1	4	0	0	19.7	541	8.04
290	-0.1	17.8	-0.1	1.1	-0.1	-0.1	15.974	-0.1	-0.1	0.05	0.6	3.2	0	0	17.8	389	7.97
291	-0.1	18.925	-0.1	1	-0.1	-0.1	16.4	-0.1	-0.1	0.348	0.7	3.1	0	0	15.8	385	8.06
292	-0.1	33.134	-0.1	0.8	-0.1	-0.1	31.756	-0.1	-0.1	-0.1	1	3.9	0	0	20.5	540	8.00
293	-0.1	16.289	-0.1	1	-0.1	-0.1	17.124	-0.1	-0.1	-0.1	0.5	3.4	0	0	17.4	399	7.95
294	**0.277**	835.83	-0.1	0	-0.1	-0.1	**611.364**	-0.1	-0.1	0.052	**8.1**	42	0	0	15.6	**6080**	7.36
295	-0.1	23.645	-0.1	0.9	-0.1	-0.1	18.945	-0.1	-0.1	-0.1	0.8	3.2	0	0	15	400	8.17
296	**0.039**	167.572	-0.1	0.8	-0.1	-0.1	**407.115**	-0.1	-0.1	0.045	1.9	28.9	0	0	16.3	**2740**	7.78
297	**0.014**	67.658	-0.1	0.9	-0.1	-0.1	76.628	-0.1	-0.1	0.065	1.5	7.3	0	0	15.1	**965**	7.76
298	**0.024**	82.476	-0.1	0	-0.1	-0.1	**247.963**	-0.1	-0.1	-0.1	1.2	19.6	**1**	0	14.9	**1762**	7.41
299	**0.02**	75.574	-0.1	1.5	-0.1	-0.1	**229.476**	-0.1	-0.1	-0.1	1.1	17.5	**1**	**1**	17	**1614**	7.48
300	**0.018**	55.473	-0.1	3.5	-0.1	-0.1	**103.239**	-0.1	-0.1	-0.1	1.1	9	0	0	18.9	**1031**	7.92
301	-0.1	34.502	-0.1	0.6	-0.1	-0.1	31.026	-0.1	-0.1	-0.1	1.1	4.1	**1**	0	27.9	531	7.81
341	-0.1	37.873	-0.1	1	-0.1	-0.1	40.691	-0.1	-0.1	0.288	1	5.4	**1**	**1**	13.3	656	7.60

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #14 Grand SCD (Castle Valley Area)



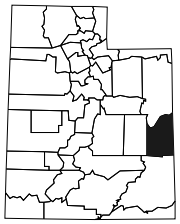
Map Scale 1:69,554
(1 inch = 1.1 miles)

Legend

- *2000 Sample Location*
- *Irrigated Cropland*
- *Water Body*
- *SCD Boundary*
- *Primary Route*
- *Primary Road*
- *Other Road*
- *Perennial Stream*
- *Intermittent Stream*
- *Canal or Ditch*

N

SCD Location



Utah Department of Agriculture and Food GIS January, 2001

Grand District (Spanish Valley Area)

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected. Fourteen samples have EC values greater than 750 μmhos/cm. They are samples 329, 331 through 337, 342, 344, 346, 347, 353, and 361 with values ranging from 871 to 2,110. None of the samples exceeded the severe-injury level of 3,000 μmhos/cm, which affects most plants.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. Sample 337 has an elevated SAR value of 10.1.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates ranging from 1.82 to 6.52 with a mean of 3.01, which is common for water in Utah. None of the samples exceed the 8.5 level.

Samples 329, 337, and 342 have elevated molybdenum (Mo). Samples 193, 195 through 200, 219, 220 and 304 have elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

Selenium (Se) can cause damage to plants and livestock that eat them when its concentration exceeds 0.025 ppm. Sample 337 has a selenium value of 0.035 exceeding the standard.

No other elements were found in concentrations harmful to plants.

Livestock:

Only sample 342 is not suitable for livestock because of elevated sulfur (S) with a value of 375.0 ppm. Sulfate can cause water to be off flavored and also diarrhea in animals not used to drinking it. Problems start when the sulfur level in water exceeds 167 ppm. **Culinary:**

The water in this area ranges from soft to very hard, with GPG (grains per gallon) ranging from 1 to 28.4 with a mean of 7.13. Water temperatures ranged from 12.5 to 21.2 and a mean of 17.18 °C. The pH for the area has a mean of 7.92 and ranges from 7.16 to 8.75.

Salinity (EC) for samples 329, 331 through 337, 342, 344, 346, 347, 353, and 361 with values ranging from 871 to 2,110 exceed the EPA aesthetic standard of 833 μmhos/cm. At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333.

Several minerals were found to exceed the aesthetic drinking water quality standard. Samples 330 and 346 have high iron (Fe). This can cause discoloration of plumbing fixtures and promote the growth of iron bacteria, which also stains anything that it contacts. Again, this is an aesthetic issue, not a health concern.

Three samples in this district have high manganese (Mn) concentrations—330, 342, and 346. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

Samples 329, 331 through 336, 342, 346, 347, 353, and 361 also have high sulfur (S). Sulfate is an anion that can cause flavor problems in drinking water at concentrations greater than 83 ppm of soluble sulfur. Bacteria in the water use sulfur and produce hydrogen sulfide gas (rotten egg gas). The bacteria that produce this compound can live in plumbing fixtures and even hot water heaters. It is not uncommon to get strong odors when the hot water is turned on in areas where there is high sulfate. Generally people cannot tolerate the odor from this gas. Even if the gas is not present high sulfate concentrations can cause diarrhea in people not used to drinking it.

Selenium (Se) at concentrations greater than 0.01 ppm exceed EPA health standards. Sample 337 has selenium at 0.035 ppm, exceeding the selenium standard for drinking water.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develop only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminates are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Sample Site Test Data for Grand District (Spanish Valley Area)

Data from listed sample numbers continue on next page

Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
302	-0.1	-0.1	-0.1	0.074	-0.1	29.299	-0.1	8.763	-0.1	0	-0.1	-0.1
329	-0.1	-0.1	-0.1	-0.1	-0.1	98.056	-0.1	30.846	-0.1	-1	-0.1	-0.1
330	0.711	-0.1	-0.1	0.153	-0.1	40.22	-0.1	-0.1	-0.1	-1	-0.1	0.025
331	-0.1	-0.1	-0.1	-0.1	-0.1	131.972	-0.1	9.434	-0.1	-1	-0.1	-0.1
332	-0.1	-0.1	-0.1	-0.1	-0.1	140.501	-0.1	7.758	-0.1	-1	-0.1	0.041
333	-0.1	-0.1	-0.1	-0.1	-0.1	122.331	-0.1	16.033	-0.1	-1	-0.1	-0.1
334	-0.1	-0.1	-0.1	0.032	-0.1	123.176	-0.1	20.498	-0.1	-1	-0.1	-0.1
335	-0.1	-0.1	-0.1	0.02	-0.1	135.422	-0.1	16.832	-0.1	-1	-0.1	-0.1
336	-0.1	-0.1	-0.1	0.02	-0.1	135.526	-0.1	20.08	-0.1	-1	-0.1	-0.1
337	0.046	-0.1	0.679	-0.1	-0.1	9.331	-0.1	47.39	-0.1	-1	-0.1	0.04
338	-0.1	-0.1	-0.1	0.08	-0.1	31.454	-0.1	-0.1	-0.1	-1	-0.1	0.025
339	-0.1	-0.1	-0.1	0.045	-0.1	61.766	-0.1	17.369	-0.1	-1	-0.1	-0.1
340	-0.1	-0.1	-0.1	0.057	-0.1	45.362	-0.1	7.296	-0.1	-1	-0.1	-0.1
342	-0.1	-0.1	0.075	0.023	-0.1	378.706	-0.1	41.937	-0.1	-1	-0.1	-0.1
343	-0.1	-0.1	-0.1	0.063	-0.1	32.056	-0.1	15.583	-0.1	-1	-0.1	-0.1
344	-0.1	-0.1	-0.1	0.086	-0.1	130.397	-0.1	27.45	-0.1	-1	-0.1	-0.1
345	-0.1	-0.1	-0.1	0.067	-0.1	32.985	-0.1	11.657	-0.1	-1	-0.1	0.021
346	-0.1	-0.1	-0.1	0.024	-0.1	150.606	-0.1	33.004	-0.1	-1	-0.1	-0.1
347	-0.1	-0.1	-0.1	-0.1	-0.1	113.394	-0.1	16.936	-0.1	-1	-0.1	-0.1
348	-0.1	-0.1	-0.1	0.056	-0.1	39.51	-0.1	11.243	-0.1	-1	-0.1	-0.1
349	-0.1	-0.1	-0.1	0.057	-0.1	63.389	-0.1	18.241	-0.1	-1	-0.1	0.043
350	-0.1	-0.1	-0.1	0.07	-0.1	38.974	-0.1	7.69	-0.1	-1	-0.1	0.054
351	-0.1	-0.1	-0.1	0.07	-0.1	28.39	-0.1	-0.1	-0.1	-1	-0.1	0.021
352	-0.1	-0.1	-0.1	0.033	-0.1	54.448	-0.1	13.547	-0.1	-1	-0.1	0.031
353	-0.1	-0.1	-0.1	0.024	-0.1	118.134	-0.1	25.094	-0.1	-1	-0.1	-0.1
361	-0.1	-0.1	-0.1	0.024	-0.1	106.616	-0.1	16.896	-0.1	-0.1	-0.1	-0.1

Bolded and shaded values exceed minimum irrigation or livestock standards

Sample Site Test Data for Grand District (Spanish Valley Area)

Data from listed sample numbers continued on next page

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
302	-0.1	**1.94**	1.829	-0.1	12.594	-0.1	-0.1	13.641	-0.1	1	-0.1	-0.1
329	0.02	**2.755**	3.022	-0.1	37.462	-0.1	**0.017**	59.419	-0.1	1.3	-0.1	-0.1
330	**0.635**	**2.018**	1.663	-0.1	7.027	**0.075**	-0.1	4.278	-0.1	0	-0.1	-0.1
331	0.091	**2.755**	2.776	-0.1	30.256	-0.1	-0.1	42.874	-0.1	1.7	-0.1	-0.1
332	0.099	**4.578**	2.589	-0.1	28.2	-0.1	-0.1	36.787	-0.1	1.6	-0.1	-0.1
333	0.119	**3.356**	3.206	-0.1	34.347	-0.1	-0.1	43.177	-0.1	2	-0.1	-0.1
334	0.183	**3.608**	3.409	-0.1	32.885	-0.1	-0.1	46.534	-0.1	1.9	-0.1	-0.1
335	-0.1	**3.996**	3.277	-0.1	38.155	-0.1	-0.1	40.684	-0.1	3.3	-0.1	-0.1
336	0.021	**4.249**	3.066	-0.1	36.099	-0.1	-0.1	50.755	-0.1	2.5	-0.1	-0.1
337	0.048	**3.279**	13.123	-0.1	7.297	-0.1	**0.048**	169.646	-0.1	1.7	-0.1	-0.1
338	0.039	**1.824**	1.389	-0.1	11.805	-0.1	-0.1	6.562	-0.1	1.2	-0.1	-0.1
339	0.038	**2.037**	1.919	-0.1	21.746	-0.1	-0.1	20.625	-0.1	1.1	-0.1	-0.1
340	-0.1	**2.231**	1.85	-0.1	18.768	-0.1	-0.1	12.197	-0.1	1.2	-0.1	-0.1
342	0.038	**4.326**	8.741	-0.1	106.529	**0.075**	**0.012**	25.679	-0.1	1	-0.1	-0.1
343	-0.1	**1.998**	2.097	-0.1	13.529	-0.1	-0.1	16.134	-0.1	0.8	-0.1	-0.1
344	0.024	**6.518**	2.506	-0.1	40.831	-0.1	-0.1	30.396	-0.1	0.7	-0.1	-0.1
345	0.048	**2.115**	1.909	-0.1	13.795	-0.1	-0.1	13.171	-0.1	1	-0.1	-0.1
346	**0.916**	**4.598**	3.745	-0.1	61.647	**0.054**	-0.1	53.752	-0.1	0.6	-0.1	-0.1
347	0.021	**2.58**	4.299	-0.1	52.881	-0.1	-0.1	49.628	-0.1	1.4	-0.1	-0.1
348	0.037	**2.328**	2.41	-0.1	18.237	-0.1	-0.1	13.386	-0.1	1.6	-0.1	-0.1
349	-0.1	**2.638**	1.6	-0.1	21.288	-0.1	-0.1	13.79	-0.1	2.3	-0.1	-0.1
350	-0.1	**2.095**	1.441	-0.1	14.598	-0.1	-0.1	10.738	-0.1	1.6	-0.1	-0.1
351	0.022	**1.921**	1.771	-0.1	13.496	-0.1	-0.1	6.353	-0.1	1.1	-0.1	-0.1
352	0.028	**2.153**	1.647	-0.1	18.977	-0.1	-0.1	19.76	-0.1	2.1	-0.1	-0.1
353	0.037	**3.686**	3.003	-0.1	35.579	-0.1	-0.1	49.11	-0.1	3.7	-0.1	-0.1
361	0.061	**2.716**	3.297	-0.1	47.771	-0.1	-0.1	44.872	-0.1	2.9	-0.1	-0.1

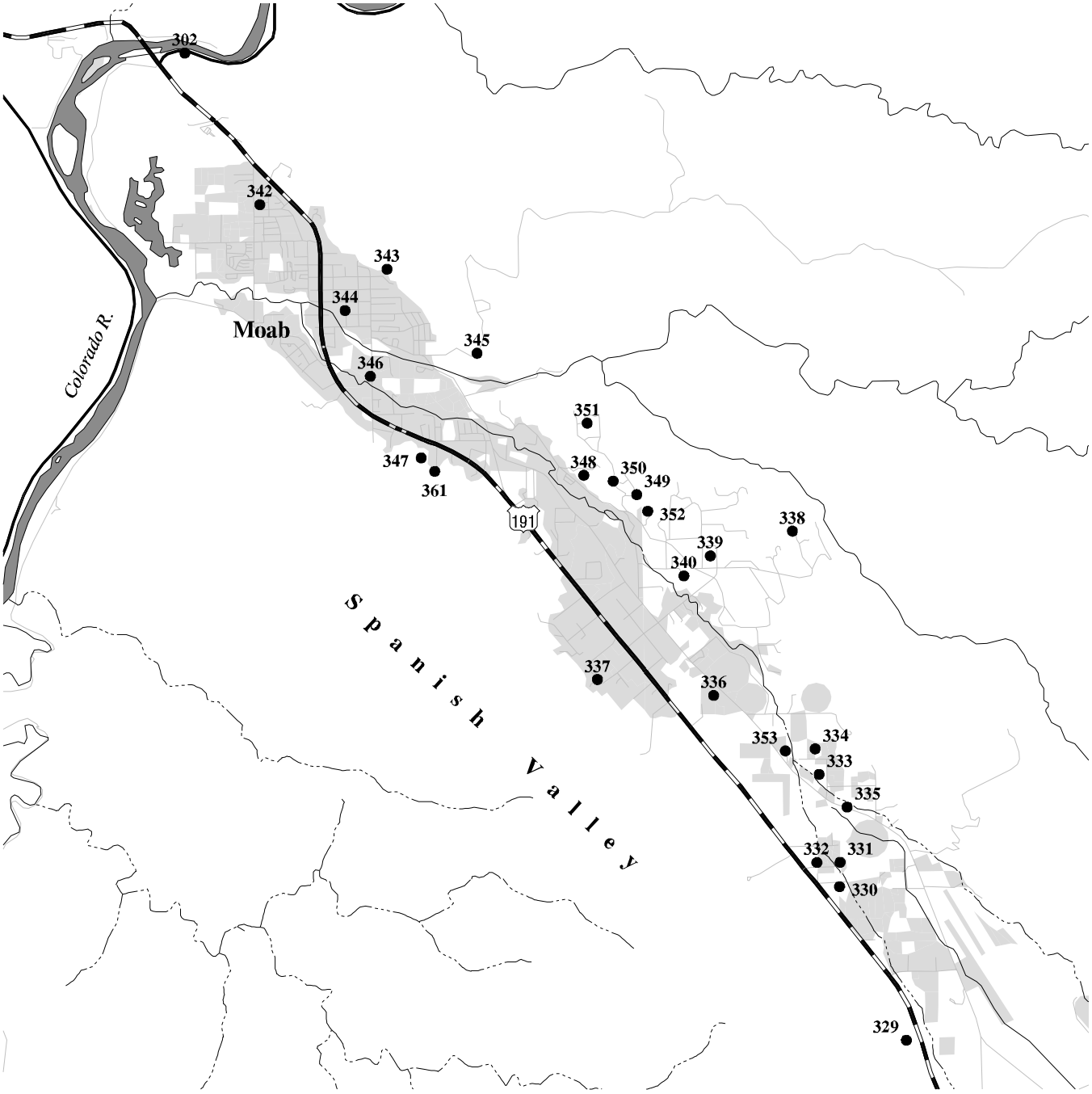
Bolded and shaded values exceed minimum irrigation or livestock standards

Sample Site Test Data for Grand District (Spanish Valley Area)

Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
302	11.541	-0.1	-0.1	-0.1	0.5	2.4	**1**	0	12.8	291	8.26
329	**113.425**	-0.1	-0.1	-0.1	1.3	7.9	0	0	16.7	**972**	7.92
330	8.825	-0.1	-0.1	0.048	0.2	2.8	**1**	**1**	18.2	266	8.10
331	**126.394**	-0.1	-0.1	-0.1	0.9	9.5	0	0	16.4	**982**	7.78
332	**98.126**	-0.1	-0.1	0.076	0.7	9.9	0	0	14.8	**968**	7.47
333	**113.519**	-0.1	-0.1	-0.1	0.9	9.2	0	0	17.3	**988**	7.64
334	**102.116**	-0.1	-0.1	0.119	1	9.1	0	0	16.3	**971**	7.64
335	**110.674**	-0.1	-0.1	-0.1	0.8	10.2	**1**	0	17.7	**998**	7.63
336	**109.405**	-0.1	-0.1	-0.1	1	10	0	0	18.6	**1033**	7.62
337	62.187	**0.035**	0.05	0.059	**10.1**	1	**1**	0	18.1	**871**	8.75
338	12.346	-0.1	-0.1	0.102	0.3	2.5	0	0	17.1	261	8.29
339	43.593	-0.1	-0.1	0.058	0.6	4.9	0	0	21.2	581	8.10
340	28.35	-0.1	-0.1	0.087	0.4	3.8	**1**	**1**	17.2	400	8.10
342	**375.009**	-0.1	-0.1	-0.1	0.3	28.4	**1**	**1**	14	**2110**	7.37
343	14.003	-0.1	-0.1	-0.1	0.6	2.7	**1**	0	18	350	8.47
344	50.053	-0.1	-0.1	0.06	0.6	10	**1**	0	17.5	**923**	7.51
345	13.92	-0.1	-0.1	0.042	0.5	2.7	0	0	18.1	336	8.18
346	**136.06**	-0.1	-0.1	-0.1	0.9	12.4	0	0	16.4	**1158**	7.86
347	**134.168**	-0.1	-0.1	-0.1	1	9.7	0	0	16.6	**983**	7.75
348	21.182	-0.1	-0.1	0.057	0.4	3.4	0	0	18.4	398	8.24
349	36.7	-0.1	-0.1	-0.1	0.4	5	0	0	19	535	7.94
350	20.538	-0.1	-0.1	-0.1	0.4	3.1	0	0	18.9	354	8.29
351	11.062	-0.1	-0.1	-0.1	0.2	2.4	0	0	19.8	269	8.27
352	39.454	-0.1	-0.1	0.106	0.6	4.3	0	0	16.4	508	8.06
353	**90.499**	-0.1	-0.1	0.351	1	9	0	0	18.8	**919**	7.64
361	**128.182**	-0.1	-0.1	0.051	0.9	9	0	0	12.5	**925**	7.16

Data from listed sample numbers continued on next page

Map #15 Grand SCD (Spanish Valley Area)

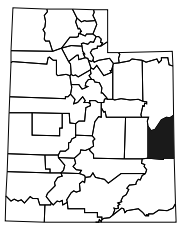


Map Scale 1:83,987
(1 inch = 1.33 miles)

Legend

- *2000 Sample Location*
- *Irrigated Cropland*
- *Water Body*
- *SCD Boundary*
- *Primary Route*
- *Primary Road*
- *Other Road*
- *Perennial Stream*
- *Intermittent Stream*
- *Canal or Ditch*

SCD Location



Utah Department of Agriculture and Food GIS January, 2001

San Juan District (La Sal Area)

Irrigation:

Salinity (EC) is a measurement of the concentration of ionic salts dissolved in water. It is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity indicates higher concentration of dissolved salts. Water that is high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected. Three samples have EC values greater than 750 μmhos/cm (320, 321, and 328). No samples exceeded the severe-injury level of 3,000 μmhos/cm, which affects most plants.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. None of the samples exceed this standard.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates, which is common for water in Utah.

Five samples, 320 through 323 and 328, have elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

No other elements were found in concentrations harmful to plants.

Livestock:

No samples exceeded any livestock parameters that were measured.

Culinary:

The water in this area ranges from moderately hard to hard, with GPG (grains per gallon) ranging from 5 to 9.9 with a mean of 6.63. Water temperatures ranged from 12.2 to 19.5 and a mean of 14.3 °C. The pH for the area has a mean of 7.89 and ranges from 7.65 to 8.1.

Salinity for three sample sites (320, 321, and 328) exceed the EPA aesthetic standard of 833 μmhos/cm. At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333.

Samples 320 and 328 have high manganese (Mn) level. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

Sample 328 has high sulfur (S), at a concentration of 101.56 ppm. Sulfate is an anion that can cause flavor problems in drinking water if there is more than 83 ppm of soluble sulfur. Bacteria in the water use sulfur and produce hydrogen sulfide gas (rotten egg gas). The bacteria that produce this compound can live in plumbing fixtures and even hot water heaters. It is not uncommon to get strong odors when the hot water is turned on in areas where there is high sulfate. Generally people cannot tolerate the odor from this gas. Even if the gas is not present high sulfate concentrations can cause diarrhea in people not used to drinking it.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli develop only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contaminates are entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Sample 328 is contaminated with Coliform. Sample 328 is also contaminated with E. coli. These wells should be inspected carefully to determine the source of contamination.

Sample Site Test Data for San Juan District (La Sal Area)

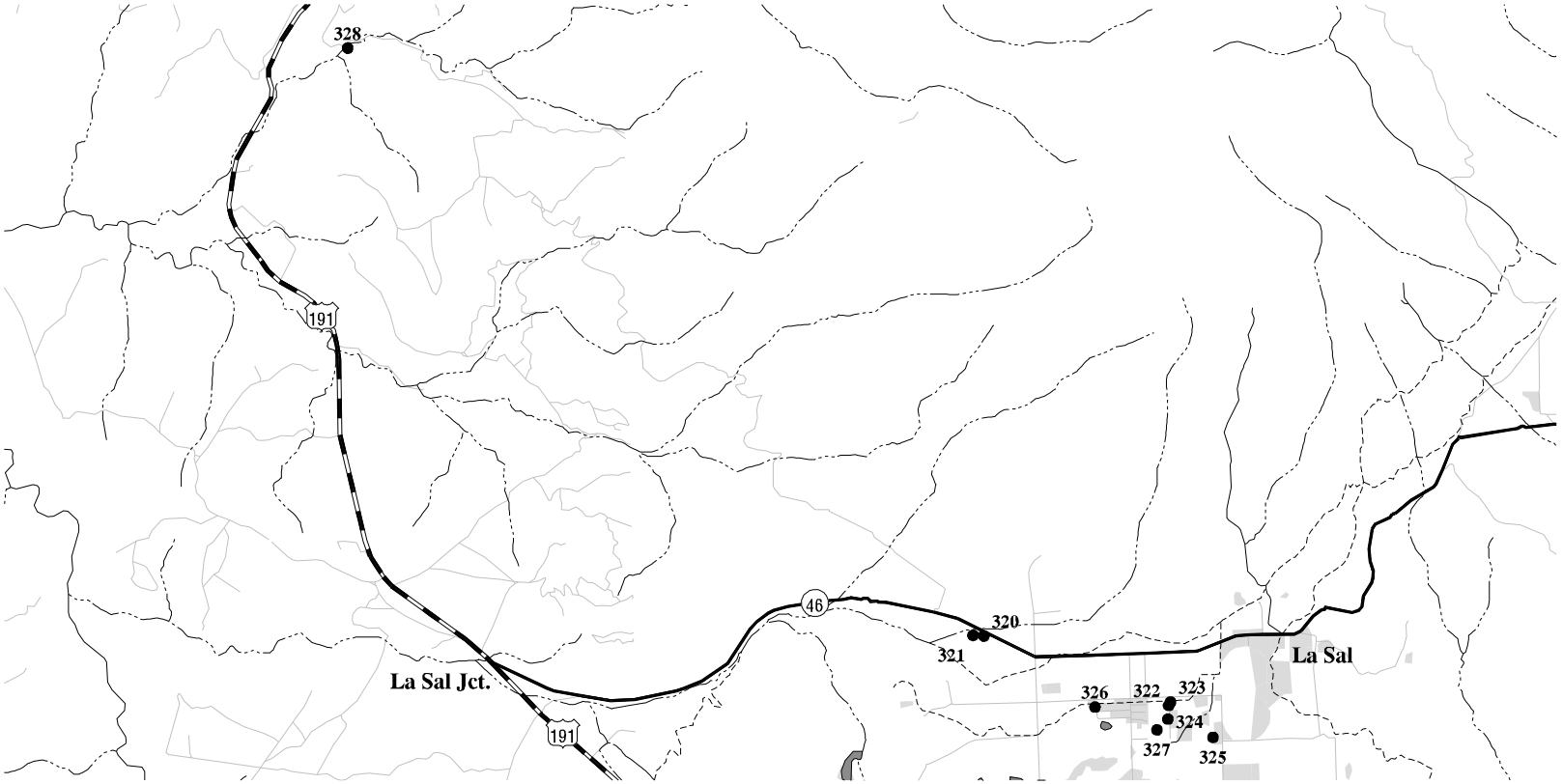
Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
320	-0.1	-0.1	-0.1	0.033	-0.1	92.116	-0.1	18.706	-0.1	-1	-0.1	-0.1
321	-0.1	-0.1	-0.1	0.029	-0.1	107.545	-0.1	32.55	-0.1	-1	-0.1	-0.1
322	-0.1	-0.1	-0.1	0.029	-0.1	68.951	-0.1	9.835	-0.1	-1	-0.1	-0.1
323	-0.1	-0.1	-0.1	0.026	-0.1	69.285	-0.1	8.721	-0.1	-1	-0.1	-0.1
324	-0.1	-0.1	-0.1	0.028	-0.1	71.202	-0.1	5.962	-0.1	-1	-0.1	-0.1
325	-0.1	-0.1	-0.1	0.079	-0.1	103.669	-0.1	6.571	-0.1	-1	-0.1	-0.1
326	-0.1	-0.1	-0.1	-0.1	-0.1	58.538	-0.1	8.928	-0.1	-1	-0.1	-0.1
327	-0.1	-0.1	-0.1	0.038	-0.1	74.779	-0.1	6.45	-0.1	-1	-0.1	-0.1
328	-0.1	-0.1	-0.1	0.091	-0.1	57.252	-0.1	19.689	-0.1	-1	-0.1	-0.1

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
320	0.084	**4.443**	5.521	-0.1	44.869	**0.042**	**0.045**	31.904	-0.1	1.2	-0.1	-0.1
321	0.05	**3.977**	2.473	-0.1	32.906	-0.1	**0.016**	43.73	-0.1	1.3	-0.1	-0.1
322	0.149	**3.492**	3.263	-0.1	24.237	-0.1	**0.015**	17.622	-0.1	1	-0.1	-0.1
323	0.287	**3.453**	2.909	-0.1	23.557	-0.1	**0.012**	17.389	-0.1	0.9	-0.1	-0.1
324	0.054	**4.21**	2.756	-0.1	21.95	-0.1	-0.1	16.783	-0.1	0.8	-0.1	-0.1
325	-0.1	**5.471**	1.49	-0.1	14.824	-0.1	-0.1	14.933	-0.1	2.9	-0.1	-0.1
326	0.023	**3.298**	2.047	-0.1	26.797	-0.1	-0.1	21.227	-0.1	0.7	-0.1	-0.1
327	-0.1	**3.977**	2.35	-0.1	19.405	-0.1	-0.1	16.566	-0.1	1.1	-0.1	-0.1
328	0.153	**9.816**	10.934	-0.1	112.86	**0.144**	**0.105**	105.502	-0.1	1.2	-0.1	-0.1

Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
320	81.411	-0.1	-0.1	-0.1	0.7	8	0	0	12.2	**926**	8.1
321	73.726	-0.1	-0.1	0.242	0.9	8.2	0	0	19.5	**815**	7.71
322	40.668	-0.1	-0.1	-0.1	0.5	5.4	0	0	12.5	605	7.94
323	40.104	-0.1	-0.1	-0.1	0.5	5.4	0	0	14.2	591	7.98
324	28.307	-0.1	-0.1	-0.1	0.4	5.4	0	0	13.1	569	7.84
325	14.329	-0.1	-0.1	-0.1	0.4	6.9	0	0	12.2	652	7.65
326	42.459	-0.1	-0.1	0.344	0.6	5	0	0	15.6	590	7.97
327	28.739	-0.1	-0.1	-0.1	0.4	5.5	0	0	12.7	559	7.85
328	**101.564**	-0.1	-0.1	-0.1	1.9	9.9	**1**	**1**	16.7	**1424**	7.95

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #16 San Juan SCD (La Sal Area)



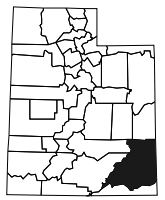
Legend

- *2000 Sample Location*
- *Irrigated Cropland*
- *Water Body*
- *SCD Boundary*
- *Primary Route*
- *Primary Road*
- *Other Road*
- *Perennial Stream*
- *Intermittent Stream*
- *Canal or Ditch*

Map Scale 1:114,294
(1 inch = 1.8 miles)

N

SCD Location



Utah Department of Agriculture and Food GIS January, 2001

San Juan District (Monticello / Blanding Area)

Irrigation:

Salinity, a measure of concentration of ionic salts dissolved in water, is measured as electrical conductivity (EC), with units of micro-mhos per centimeter (μmhos/cm). Higher conductivity values indicate higher concentrations of dissolved salts. Water high in salts increases osmotic pressures, making it difficult for plants to get water necessary for growth. Generally when the EC exceeds 750 μmhos/cm salt-sensitive plants begin to be affected. Thirty-two samples have EC values greater than 750 μmhos/cm. They are samples 14, 15, 17, 19, 20, 23 through 27, 29 through 31, 37, 38, 40, 41, 48, 307, 308, 309, 311, 314 through 319, and 357 through 360 with values ranging from 751 to 41,300. Five samples–14, 27, 315, 316, and 318–exceeded the severe-injury level of 3,000 μmhos/cm, which affects most plants.

Sodium Adsorption Ratio (SAR) is a measure of how much sodium (Na) is in solution compared to calcium and magnesium. Excessive sodium in the soil causes soil particles to repel each other. This destroys the structure of the soil, preventing air and water movement. SAR values greater than 3 can begin to cause problems for sensitive plants and values greater than 9 cause severe problems. Fourteen samples in this district—numbers 16, 21, 24, 25, 27, 29 through 31, 41, 45 through 47, 312, and 318 have an elevated SAR value of 3 or higher. Seven of these samples—numbers 21, 24, 25, 29, 30, 31, and 318—have SAR values greater than 9.

Bicarbonate (HCO_3) is an ion common to water solutions. It can damage plants in excessive amounts, especially when used in sprinkler irrigation. Bicarbonate can also cause white deposits on plants and their fruits, which affect their visual appeal. Bicarbonate also amplifies the effects of sodium when both are present. Special attention is needed when using water with excessive bicarbonate. With sensitive plants, minor problems appear with bicarbonate concentrations in excess of 1.5 and severe problems when it exceeds 8.5. All of the samples have high bicarbonates except for 14, 28, 32, 34, 318, and 319. The range for bicarbonates is from 0.68 to 11.45 with a mean of 4.63, which is common for water in Utah. Six of the samples–23, 24, 27, 29, 30, and 314–exceed the 8.5 level.

Chlorine, found in the form of chloride (Cl^-), can damage sensitive plants at concentrations above 145 ppm and concentrations exceeding 355 ppm can cause severe damage to almost all plants. Samples 14, 17, 27, 315, and 316 have elevated chlorine. Sample 14 has a value of 378.7 exceeding the severe damage standard. Using this water in sprinkler irrigation, especially in windy conditions, increases the problem.

Samples 315 and 358 have elevated iron (Fe). Iron is a micronutrient and is required for plant growth. However, when it exceeds concentrations above 5 ppm it can injure plants.

Manganese above 0.2 ppm can injure plants and cause reduction in dry matter production. Excess manganese interferes with the plant's ability to use other nutrients such as calcium. Thirteen samples–18, 23, 33, 35, 37, 39, 40, 49, 306, 313, 315, 316, and 358–have elevated concentrations of manganese (Mn).

Twenty-one samples–12, 13, 306 through 319, and 356 through 360–have elevated molybdenum (Mo). Though molybdenum is not toxic to plants at normal concentrations found in soil and water it can injure livestock that feed on plants irrigated with water that exceeds 0.01 ppm.

Three samples have elevated zinc (Zn) 309, 356, and 360. Zinc is a micronutrient and is required for plant growth. However, in excess of 2 ppm it can injure plants.

No other elements were found in concentrations harmful to plants.

Livestock:

Samples 14, 15, 27, 37, 38, 314 through 316, 318, and 358 are not suitable for livestock because of elevated sulfur (S) with values greater than 167-ppm sulfur. Sulfate can cause water to be off flavored and also diarrhea in animals not used to drinking it. Problems start when the sulfur level in water exceeds 167 ppm.

Three samples–14, 27, and 318–have EC values which exceed the livestock standard of 3,333 μmhos/cm.

Culinary:

The water in this area ranges from soft to very hard, with GPG (grains per gallon) ranging from 0.2 to 66.5 with a mean of 9.16. Water temperatures ranged from 7.9 to 28.4 and a mean of 15.7 °C. The pH for the area has a mean of 7.82 and ranges from 5.89 to 9.44.

Salinity for samples 14, 15, 17, 19, 20, 23 through 27, 29 through 31, 37, 38, 40, 41, 48, 308, 309, 311, 314 through 319, and 357 through 360 exceed the EPA aesthetic standard of 833 μmhos/cm. At this level the water may be off-flavored but it is not a health problem until the EC level reaches 3,333. Five samples–14, 27, 315, 316, and 318–exceed the health standard.

Several minerals were found to exceed the aesthetic drinking water quality standard. Samples 23, 315, 316, and 358 have high iron (Fe). This can cause discoloration of plumbing fixtures and promote the growth of iron bacteria, which also stains anything that it contacts. Again, this is an aesthetic issue, not a health concern.

Twenty-three samples have high manganese (Mn) concentrations 18, 21, 23, 29, 31 through, 33, 35, 37 through 43, 49, 306, 313 through 316, 318 and 358. EPA has set an aesthetic standard of 0.05 ppm for manganese. Higher concentrations may cause discoloration of plumbing fixtures and have an off flavor.

Samples 14, 15, 27, 37, 38, 308, 314, 315, 316, 318, 319, and 358 through 360 have high concentrations of sulfur. Sulfate is an anion that can cause flavor problems in drinking water if there is more than 83 ppm of soluble sulfur. Bacteria in the water use sulfur and produce hydrogen sulfide gas (rotten egg gas). The bacteria that produce this compound can live in plumbing fixtures and even hot water heaters. It is not uncommon to get strong odors when the hot water is turned on in areas where there is high sulfate. Generally people cannot tolerate the odor from this gas. Even if the gas is not present, high sulfate concentrations can cause diarrhea in people not used to drinking it.

The most serious problem with drinking water from private water systems is bacterial contamination. Because disease-causing organisms are less common, non-parasitic bacteria associated with parasitic bacteria are used as indicators to assess whether water is contaminated with harmful bacteria. Coliform bacteria can occur in the soil, whereas E. coli

develop only in the digestive systems of mammals. Although presence of Coliform bacteria in a water sample is not a direct cause of disease, it indicates that surface waters, soil, or other contamination is entering the well. Presence of E. coli indicates that mammalian fecal material is entering the well.

Bacterial contamination is most commonly the result of a well construction problem and may result from inadequate capping, leaking well casing, improper grouting, or lack of casing. For E. coli, defective septic systems, manure operations or septic systems too close to wells, leaky sewer systems, or shallow water tables are also significant causes.

Samples 12, 14, 15, 17, 18, 20, 21, 26, 29, 34, 38, 44, 47, 307, 308, 311 through 314, and 317 through 319 are contaminated with Coliform. Samples 15 and 319 were contaminated with E. coli. These wells should be inspected carefully to determine the source of contamination.

Sample Site Test Data for San Juan District (Monticello/Blanding Areas)

Data from listed sample numbers continued on next page

Sample	Al	As	B	Ba	Be	Ca	Cd	Cl	Co	CO3	Cr	Cu
12	-0.1	-0.1	-0.1	0.0715	-0.1	50.24	-0.1	-0.1	-0.1	-0.1	-0.1	0.0303
13	-0.1	-0.1	-0.1	0.1323	-0.1	35.71	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
14	-0.1	-0.1	0.228	0.0329	-0.1	393.91	-0.1	**378.7**	-0.1	-0.1	-0.1	-0.1
15	0.0884	-0.1	0.0803	0.0546	-0.1	172.53	-0.1	24.84	-0.1	-0.1	-0.1	-0.1
16	-0.1	-0.1	0.0701	-0.1	-0.1	11.07	-0.1	8.23	-0.1	-0.1	-0.1	-0.1
17	-0.1	-0.1	0.0899	0.1677	-0.1	136.64	-0.1	**154.7**	-0.1	-0.1	-0.1	-0.1
18	-0.1	-0.1	-0.1	0.8876	-0.1	59.84	-0.1	4.79	-0.1	-0.1	-0.1	-0.1
19	-0.1	-0.1	-0.1	0.0585	-0.1	121.09	-0.1	83.23	-0.1	-0.1	-0.1	0.0239
20	-0.1	-0.1	-0.1	0.028	-0.1	27.28	-0.1	71.07	-0.1	-0.1	-0.1	-0.1
21	-0.1	-0.1	0.0994	0.0377	-0.1	20.52	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
23	0.5248	-0.1	-0.1	0.3542	-0.1	49.23	-0.1	19.79	-0.1	-0.1	-0.1	-0.1
24	-0.1	-0.1	0.0882	-0.1	-0.1	12.52	-0.1	28.97	-0.1	-0.1	-0.1	-0.1
25	-0.1	-0.1	0.1429	-0.1	-0.1	3.6	-0.1	18.84	-0.1	-0.1	-0.1	-0.1
26	-0.1	-0.1	0.1446	0.4098	-0.1	97.67	-0.1	45.58	-0.1	-0.1	-0.1	0.0364
27	-0.1	-0.1	0.1662	0.0123	-0.1	113.1	-0.1	**170.45**	-0.1	-0.1	-0.1	-0.1
28	-0.1	-0.1	-0.1	0.0308	-0.1	30.32	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
29	0.041	-0.1	0.1216	-0.1	-0.1	6.69	-0.1	19.7	-0.1	-0.1	-0.1	-0.1
30	-0.1	-0.1	0.1427	-0.1	-0.1	2.2	-0.1	32.13	-0.1	-0.1	-0.1	0.0304
31	-0.1	-0.1	0.1318	0.0243	-0.1	24	-0.1	35.56	-0.1	-0.1	-0.1	-0.1
32	0.0534	-0.1	0.1739	0.1019	-0.1	20.12	-0.1	20.48	-0.1	1.164	-0.1	-0.1
33	-0.1	-0.1	-0.1	0.0693	-0.1	47.71	-0.1	4.13	-0.1	-0.1	-0.1	-0.1
34	0.1263	-0.1	-0.1	0.0415	-0.1	26.84	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
35	-0.1	-0.1	-0.1	0.3978	-0.1	48.89	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
36	-0.1	-0.1	-0.1	0.0376	-0.1	44.71	-0.1	4.46	-0.1	-0.1	-0.1	-0.1
37	-0.1	-0.1	-0.1	-0.1	-0.1	212.96	-0.1	7.67	-0.1	-0.1	-0.1	-0.1
38	-0.1	-0.1	-0.1	-0.1	-0.1	198.99	-0.1	9.5	-0.1	-0.1	-0.1	-0.1
39	-0.1	-0.1	-0.1	0.0333	-0.1	71.39	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
40	-0.1	-0.1	-0.1	0.0324	-0.1	150.62	-0.1	138.24	-0.1	-0.1	-0.1	-0.1
41	-0.1	-0.1	0.1481	0.0744	-0.1	33.06	-0.1	17.41	-0.1	-0.1	-0.1	-0.1
42	-0.1	-0.1	-0.1	0.0562	-0.1	45.51	-0.1	6.52	-0.1	-0.1	-0.1	-0.1
43	-0.1	-0.1	-0.1	0.051	-0.1	42.36	-0.1	6.25	-0.1	-0.1	-0.1	-0.1
44	-0.1	-0.1	-0.1	0.0644	-0.1	23.81	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
45	-0.1	-0.1	-0.1	0.0511	-0.1	15.22	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
46	-0.1	-0.1	0.3469	0.0478	-0.1	19.59	-0.1	11.65	-0.1	-0.1	-0.1	-0.1
47	-0.1	-0.1	0.3979	0.0614	-0.1	12.9	-0.1	14.18	-0.1	-0.1	-0.1	-0.1
48	-0.1	-0.1	-0.1	0.0768	-0.1	97.54	-0.1	48.13	-0.1	-0.1	-0.1	-0.1
49	-0.1	-0.1	0.0921	0.0413	-0.1	34.13	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
306	-0.1	-0.1	-0.1	0.031	-0.1	53.88	-0.1	16.211	-0.1	-1	-0.1	-0.1
307	-0.1	-0.1	-0.1	0.033	-0.1	99.589	-0.1	40.839	-0.1	-1	-0.1	-0.1
308	-0.1	-0.1	-0.1	0.036	-0.1	212.608	-0.1	52.929	-0.1	-1	-0.1	-0.1
309	-0.1	-0.1	-0.1	0.083	-0.1	75.296	-0.1	10.195	-0.1	-1	-0.1	-0.1
310	-0.1	-0.1	-0.1	0.06	-0.1	41.526	-0.1	16.184	-0.1	-1	-0.1	-0.1
311	-0.1	-0.1	-0.1	0.071	-0.1	173.44	-0.1	133.924	-0.1	-1	-0.1	0.029
312	-0.1	-0.1	-0.1	-0.1	-0.1	17.86	-0.1	4.396	-0.1	-1	-0.1	**-0.1**
313	-0.1	-0.1	-0.1	0.032	-0.1	51.313	-0.1	5.204	-0.1	-1	-0.1	-0.1
314	-0.1	-0.1	-0.1	-0.1	-0.1	396.697	-0.1	131.725	-0.1	-1	-0.1	-0.1
315	2.536	-0.1	0.134	-0.1	0.01	501.536	-0.1	**255.172**	0.056	-1	-0.1	-0.1
316	-0.1	-0.1	0.103	-0.1	-0.1	470.594	-0.1	**235.146**	-0.1	-1	-0.1	-0.1
317	-0.1	-0.1	-0.1	0.071	-0.1	149.053	-0.1	67.442	-0.1	-1	-0.1	-0.1
318	-0.1	-0.1	0.289	0.06	-0.1	585.131	-0.1	-0.1	-0.1	-1	-0.1	-0.1
319	0.23	-0.1	-0.1	0.066	-0.1	82.635	-0.1	27.983	-0.1	-1	-0.1	-0.1
356	-0.1	-0.1	-0.1	0.145	-0.1	109.268	-0.1	3.829	-0.1	-0.1	-0.1	-0.1
357	-0.1	-0.1	-0.1	0.131	-0.1	111.663	-0.1	51.274	-0.1	-0.1	-0.1	-0.1
358	-0.1	-0.1	-0.1	0.049	-0.1	207.535	-0.1	51.526	-0.1	-0.1	-0.1	-0.1
359	-0.1	-0.1	-0.1	0.065	-0.1	162.011	-0.1	23.676	-0.1	-0.1	-0.1	-0.1
360	-0.1	-0.1	-0.1	0.056	-0.1	177.273	-0.1	49.106	-0.1	-0.1	-0.1	-0.1

Bolded and shaded values exceed minimum irrigation or livestock standards

Sample Site Test Data for San Juan District (Monticello/Blanding Areas)

Data from listed sample numbers continued on next page

Sample	Fe	HCO3	K	Li	Mg	Mn	Mo	Na	Ni	NO3-N	P	Pb
12	0.0262	**2.33**	1.47	-0.1	6.69	-0.1	**0.014**	6.83	-0.1	1	-0.1	-0.1
13	-0.1	**2.91**	1.92	-0.1	6.56	-0.1	**0.0197**	44.53	-0.1	1.3	-0.1	-0.1
14	0.0207	0.68	5.17	0.5222	266.43	-0.1	-0.1	298.06	-0.1	2.7	-0.1	-0.1
15	0.0908	**2.83**	2.6	-0.1	38.69	0.0272	-0.1	56.98	-0.1	-0.1	-0.1	-0.1
16	-0.1	**2.52**	3.16	0.0551	13.03	0.0218	-0.1	65.52	-0.1	1.2	-0.1	-0.1
17	-0.1	**5.24**	2.32	-0.1	46.32	0.0201	-0.1	37.59	-0.1	2.68	-0.1	-0.1
18	-0.1	**1.75**	4.56	-0.1	6.75	**0.2091**	-0.1	6.93	-0.1	-0.1	0.1621	-0.1
19	-0.1	**5.63**	7.4	-0.1	36.01	-0.1	-0.1	36.57	-0.1	1.6	-0.1	-0.1
20	0.046	**4.66**	0.62	-0.1	2.8	-0.1	-0.1	4	-0.1	1.5	-0.1	-0.1
21	0.2226	**3.2**	3.46	0.2173	2.67	**0.1151**	-0.1	275.72	0.0232	1.8	-0.1	-0.1
23	**1.2827**	**10.28**	6.31	-0.1	8.02	**1.099**	-0.1	2.99	-0.1	-0.1	0.2031	-0.1
24	0.0293	**10.48**	3.81	0.2395	4.41	0.0255	-0.1	307.87	-0.1	0.6	-0.1	-0.1
25	0.0479	**6.6**	2.84	0.239	2.84	0.0302	-0.1	241.43	-0.1	1.1	-0.1	-0.1
26	-0.1	**5.63**	1.46	-0.1	32.83	-0.1	-0.1	64.31	-0.1	9	0.1456	-0.1
27	-0.1	**10.86**	12.79	0.6583	98.83	0.1238	-0.1	451.49	-0.1	0.8	0.12	-0.1
28	0.0361	1.36	1.05	-0.1	2.73	-0.1	-0.1	3.56	-0.1	1.2	-0.1	-0.1
29	0.027	**9.31**	3.43	0.3119	1.71	**0.0866**	-0.1	312.92	-0.1	0.6	-0.1	-0.1
30	0.0626	**11.45**	3.31	0.3379	1.08	-0.1	-0.1	338.05	-0.1	1	-0.1	-0.1
31	0.0415	**8.34**	4.05	0.2854	15.26	**0.1936**	-0.1	249.28	-0.1	0.1	-0.1	-0.1
32	0.0849	1.46	17.51	-0.1	13.51	**0.0781**	-0.1	15.95	-0.1	0.3	0.169	-0.1
33	0.0725	**3.49**	1.92	-0.1	12.65	**0.3707**	-0.1	26.73	-0.1	-0.1	-0.1	-0.1
34	0.058	1.26	0.5	-0.1	2.5	-0.1	-0.1	2.82	-0.1	0.7	-0.1	-0.1
35	-0.1	**2.72**	1.36	-0.1	6.17	**0.3114**	-0.1	13.96	-0.1	0.6	-0.1	-0.1
36	-0.1	**3.49**	0.8	-0.1	8.05	-0.1	-0.1	21.51	-0.1	0.7	-0.1	-0.1
37	-0.1	**6.4**	5	0.1119	47.79	**1.2659**	-0.1	94.74	-0.1	0.3	-0.1	-0.1
38	0.0406	**6.69**	5.18	0.1017	47.74	**0.0798**	-0.1	86.39	-0.1	-0.1	-0.1	-0.1
39	0.0624	**3.69**	1.72	-0.1	10.35	**1.0606**	-0.1	18.32	-0.1	0.7	-0.1	-0.1
40	-0.1	**3.2**	2.56	-0.1	27.65	**1.4238**	-0.1	19.64	-0.1	-0.1	-0.1	-0.1
41	0.0285	**7.76**	5.43	0.1184	25.8	**0.0989**	-0.1	127.84	-0.1	2	-0.1	-0.1
42	0.1705	**6.4**	7.47	0.079	35.76	**0.1365**	-0.1	57.82	-0.1	0.9	-0.1	-0.1
43	-0.1	**6.98**	9.11	0.0858	41.46	**0.1275**	-0.1	57.6	-0.1	1.7	-0.1	-0.1
44	0.0341	**3.69**	3.99	0.0579	15.63	-0.1	-0.1	39.88	-0.1	1.2	-0.1	-0.1
45	0.1074	**3.69**	3.63	0.0502	7.78	-0.1	-0.1	71.54	-0.1	1.8	-0.1	-0.1
46	0.0389	**4.75**	19.58	0.2682	10.7	0.0234	-0.1	88.47	-0.1	1.5	-0.1	-0.1
47	0.0529	**5.04**	15.52	0.351	6.84	-0.1	-0.1	118.23	-0.1	4.2	-0.1	-0.1
48	-0.1	**4.07**	1.86	-0.1	21.96	-0.1	-0.1	34.49	-0.1	0.3	-0.1	-0.1
49	0.0705	**3.4**	1.14	-0.1	4.6	**0.2041**	-0.1	41.03	-0.1	2.1	-0.1	-0.1
306	0.073	**3.356**	3.513	-0.1	13.788	**0.233**	**0.08**	72.557	-0.1	1.1	-0.1	-0.1
307	0.025	**4.016**	3.069	-0.1	21.36	-0.1	**0.055**	44.266	-0.1	2.5	-0.1	-0.1
308	0.291	**3.647**	3.691	-0.1	37.689	0.034	**0.091**	48.738	-0.1	3.9	-0.1	-0.1
309	0.041	**4.365**	3.203	-0.1	12.191	0.029	**0.121**	101.49	-0.1	1.5	-0.1	-0.1
310	-0.1	**2.386**	1.7	-0.1	5.905	-0.1	**0.035**	28.787	-0.1	1.1	-0.1	-0.1
311	0.045	**6.344**	2.717	-0.1	39.977	-0.1	**0.074**	70.526	-0.1	2.6	-0.1	-0.1
312	0.117	**3.143**	3.576	-0.1	10.285	-0.1	**0.074**	68.808	-0.1	0	-0.1	-0.1
313	0.153	**3.919**	3.738	-0.1	15.394	**0.22**	**0.055**	51.493	-0.1	1	-0.1	-0.1
314	-0.1	**9.312**	5.022	-0.1	229.339	**0.164**	**0.176**	103.635	0.03	1	-0.1	-0.1
315	**23.954**	**1.668**	5.764	-0.1	271.29	**3.554**	**0.672**	184.557	0.08	0	-0.1	-0.1
316	**3.849**	**7.236**	3.69	-0.1	255.468	**1.161**	**0.355**	195.176	-0.1	1.3	-0.1	-0.1
317	-0.1	**4.52**	2.282	-0.1	21.894	-0.1	**0.045**	44.073	-0.1	4.1	-0.1	-0.1
318	0.028	1.436	64.882	-0.1	552.304	**0.113**	**2.025**	1588.426	-0.1	0.6	-0.1	-0.1
319	0.114	0.97	8.301	-0.1	25.612	-0.1	**0.1**	66.232	-0.1	1	-0.1	-0.1
356	0.078	**3.201**	2.25	-0.1	15.49	0.023	**0.014**	20.682	-0.1	0.7	-0.1	-0.1
357	0.02	**4.598**	2.546	-0.1	25.574	-0.1	**0.024**	34.462	-0.1	1.3	-0.1	-0.1
358	**6.426**	**3.104**	2.454	-0.1	37.666	**0.939**	**0.028**	21.979	-0.1	2.1	-0.1	-0.1
359	0.021	**2.716**	2.527	-0.1	28.205	0.027	**0.029**	20.176	-0.1	1.6	-0.1	-0.1
360	0.047	**5.044**	2.408	-0.1	20.565	-0.1	**0.022**	52.93	-0.1	1.6	-0.1	-0.1

Bolded and shaded values exceed minimum irrigation or livestock standards

Sample Site Test Data for San Juan District (Monticello/Blanding Areas)

Sample	S	Se	V	Zn	SAR	Hardness	Coliform	E coli	Temp	EC	pH
12	14.19	-0.1	-0.1	-0.1	0.2	3.3	**1**	0	15	294	7.73
13	18.82	-0.1	-0.1	0.1035	1.8	2.5	0	0	18.9	363	7.58
14	**718.85**	-0.1	-0.1	-0.1	2.8	38.6	**1**	0	22.5	**41300**	7.52
15	**177.31**	-0.1	-0.1	-0.1	1	12.4	**1**	**1**	24.1	**1226**	7.73
16	32.03	-0.1	-0.1	-0.1	**3.2**	1.4	0	0	28.4	461	8.05
17	48.3	-0.1	-0.1	-0.1	0.7	10.7	**1**	0	18	**1192**	7.71
18	5.08	-0.1	-0.1	0.0561	0.2	3.9	**1**	0	11.5	468	7.50
19	49.8	-0.1	-0.1	-0.1	0.7	9.2	0	0	16	**1007**	7.51
20	7.33	-0.1	-0.1	-0.1	0.2	1.8	**1**	0	16.5	**862**	7.58
21	47.87	-0.1	-0.1	0.0584	**15.2**	1.4	**1**	0	19.5	310	7.76
23	1.13	-0.1	-0.1	-0.1	0.1	3.3	0	0	12.3	**1202**	8.05
24	63.2	-0.1	-0.1	-0.1	**19.1**	1	0	0	11.9	**1351**	8.36
25	68.66	-0.1	-0.1	0.0592	**23.1**	0.4	0	0	15.8	**1080**	8.25
26	48.79	-0.1	-0.1	0.0739	1.4	7.6	**1**	0	14.1	**941**	7.61
27	**316.89**	-0.1	-0.1	0.0545	**7.5**	12.4	0	0	13	**29800**	7.59
28	7.31	-0.1	-0.1	-0.1	0.2	1.9	0	0	21.2	193	7.96
29	81.08	-0.1	-0.1	0.2718	**27.9**	0.5	**1**	0	14.2	**1363**	8.32
30	56.82	-0.1	-0.1	0.0466	**46.7**	0.2	0	0	14.7	**1443**	8.50
31	78.2	-0.1	-0.1	-0.1	**9.8**	2.3	0	0	16.9	**1227**	8.04
32	5.8	-0.1	-0.1	-0.1	0.7	2	0	0	18.5	317	9.21
33	17.49	-0.1	-0.1	0.0724	0.9	3.5	0	0	22.3	438	7.98
34	6.55	-0.1	-0.1	-0.1	0.1	1.7	**1**	0	17.2	167	7.97
35	14.93	-0.1	-0.1	-0.1	0.5	3.2	0	0	15.4	333	7.90
36	2.96	-0.1	-0.1	0.2599	0.8	3.1	0	0	15.5	348	8.00
37	**217.28**	-0.1	-0.1	-0.1	1.5	15.2	0	0	15.2	**1614**	7.72
38	**193.71**	-0.1	-0.1	-0.1	1.4	14.4	**1**	0	14.5	**1484**	8.02
39	26.24	-0.1	-0.1	-0.1	0.5	4.8	0	0	12.6	498	7.85
40	77.88	-0.1	-0.1	0.0499	0.4	10.4	0	0	18	**1126**	8.55
41	21.16	-0.1	-0.1	-0.1	**4**	3.4	0	0	18	**846**	7.64
42	24.79	-0.1	-0.1	-0.1	1.6	4.8	0	0	15.9	710	8.11
43	26.88	-0.1	-0.1	-0.1	1.5	4.9	0	0	16.7	736	8.15
44	13.63	-0.1	-0.1	-0.1	1.6	2.3	**1**	0	18.4	420	8.69
45	13.74	-0.1	-0.1	-0.1	**3.7**	1.3	0	0	18.3	440	8.52
46	19.09	-0.1	-0.1	-0.1	**4**	1.8	0	0	18.4	578	8.69
47	17.64	-0.1	-0.1	-0.1	**6.6**	1.2	**1**	0	16.5	648	8.43
48	69.05	-0.1	-0.1	0.2097	0.8	7	0	0	19.5	**838**	7.83
49	16.48	-0.1	-0.1	-0.1	1.7	2.3	0	0	14.8	407	8.40
306	50.555	-0.1	-0.1	-0.1	2.3	4	0	0	15.6	662	7.39
307	48.006	-0.1	-0.1	-0.1	1	7.1	**1**	0	17.9	**751**	7.11
308	**162.889**	-0.1	-0.1	0.153	0.8	14.6	**1**	0	15.7	**1356**	6.79
309	72.401	-0.1	-0.1	**2.393**	2.9	5.1	0	0	13.1	**855**	7.16
310	12.682	-0.1	-0.1	0.22	1.1	2.8	0	0	12.3	372	6.86
311	65.91	-0.1	-0.1	0.146	1.3	12.5	**1**	0	12.4	**1402**	7.10
312	24.365	-0.1	-0.1	0.109	**3.2**	1.6	**1**	0	13.9	487	8.07
313	32.937	-0.1	-0.1	0.638	1.6	3.9	**1**	0	14.9	583	7.36
314	**457.57**	-0.1	-0.1	-0.1	1	36.6	**1**	0	12.2	**2990**	7.11
315	**775.456**	-0.1	-0.1	0.619	1.6	45.2	0	0	14.4	**3900**	5.89
316	**662.445**	-0.1	-0.1	0.049	1.8	42.5	0	0	12.5	**3700**	6.71
317	68.914	-0.1	-0.1	-0.1	0.9	10	**1**	0	9.9	**1105**	7.58
318	**1686.669**	-0.1	-0.1	-0.1	**11.3**	66.5	**1**	0	7.9	**10230**	8.87
319	**138.781**	-0.1	-0.1	-0.1	1.6	6.3	**1**	**1**	8.8	**973**	9.44
356	62.726	-0.1	-0.1	**4.916**	0.5	7.3	0	0	12.2	319	8.13
357	47.166	-0.1	-0.1	0.14	0.8	8	0	0	14.9	**1026**	7.78
358	**167.469**	-0.1	-0.1	-0.1	0.4	14.3	0	0	12.2	**1094**	7.39
359	**122.258**	-0.1	-0.1	-0.1	0.4	11.1	0	0	13.3	**1241**	7.01
360	**89.029**	-0.1	-0.1	**4.451**	1	11.6	0	0	15	**942**	7.15

Bolded and shaded values exceed minimum irrigation or livestock standards

Map #17 San Juan SCD (Monticello and Blanding Areas)